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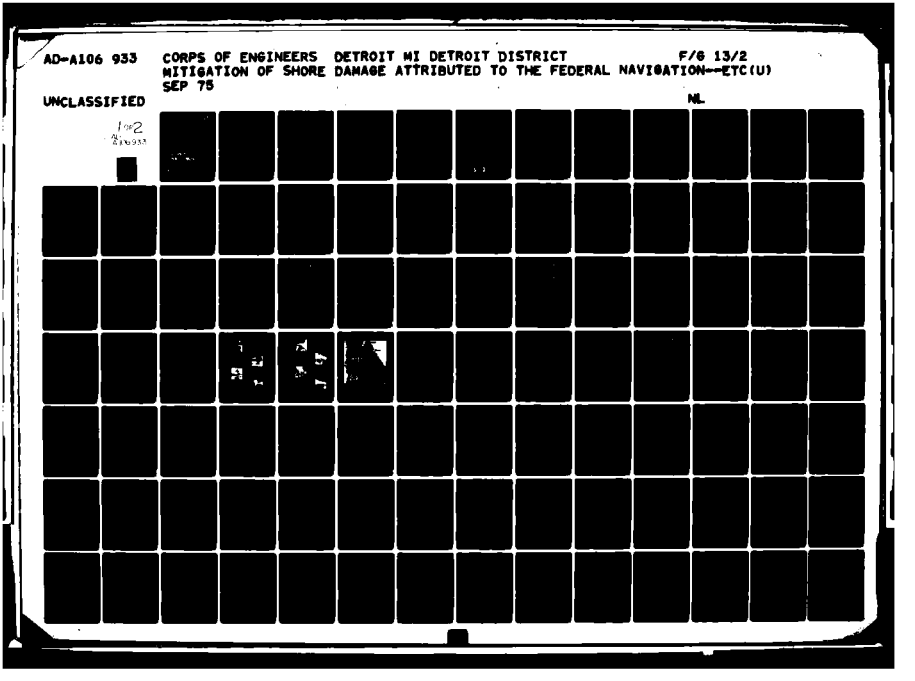
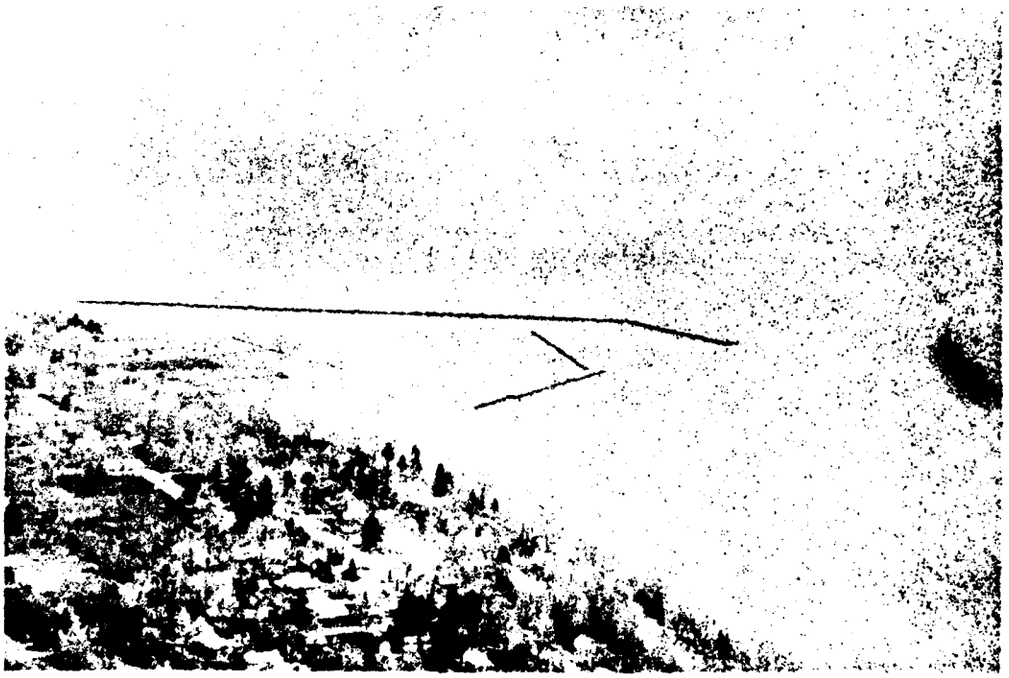


LEVEL II

FINAL

ENVIRONMENTAL STATEMENT

MITIGATION OF SHORE DAMAGE ATTRIBUTED TO THE FEDERAL NAVIGATION STRUCTURES AT PORT SANILAC HARBOR, MICHIGAN



Prepared by
U.S. Army Engineer District
Detroit, Michigan

September 1975

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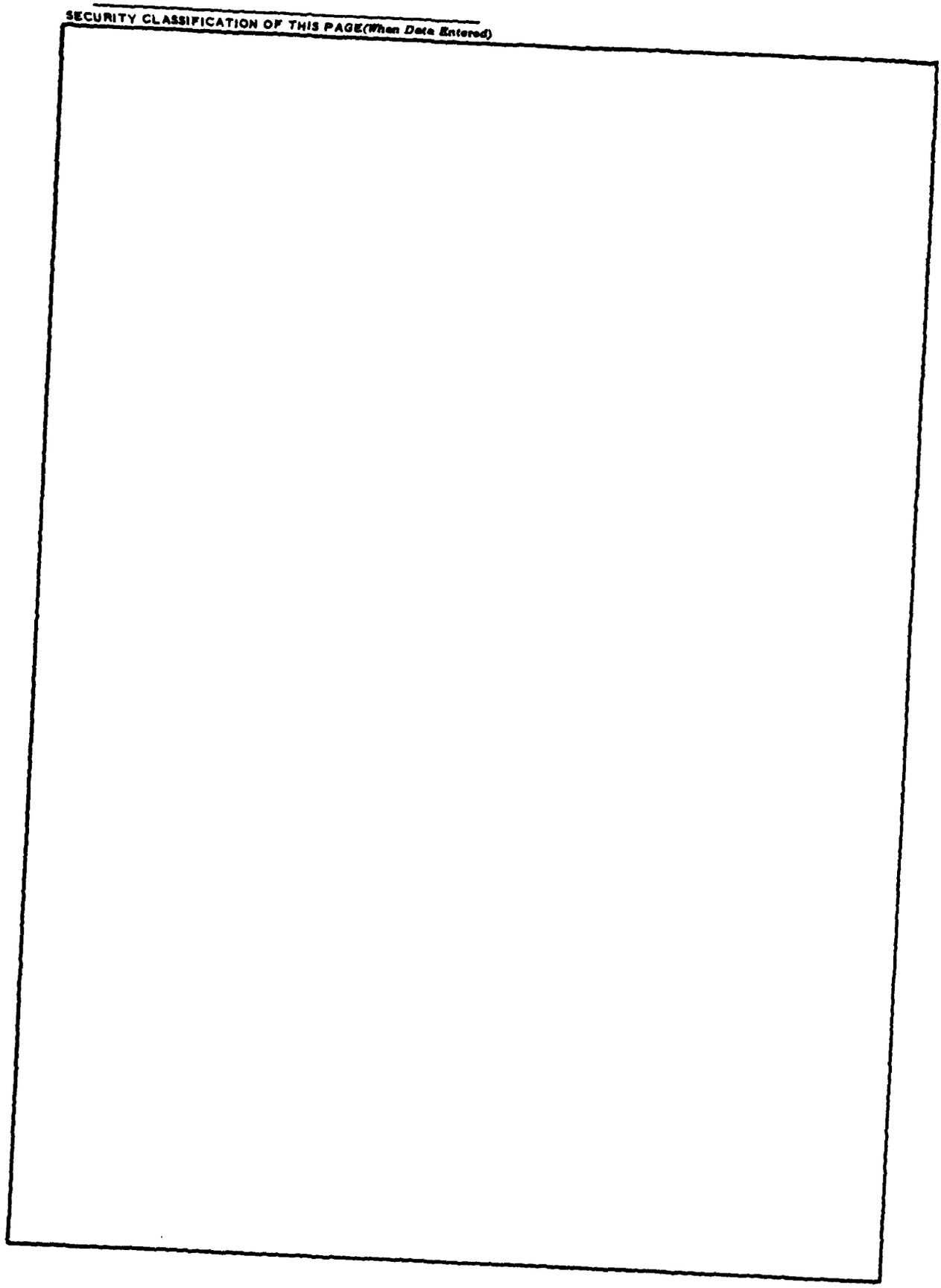

MITIGATION OF SHORE DAMAGE
ATTRIBUTED TO THE FEDERAL
NAVIGATION STRUCTURES AT
PORT SANILAC HARBOR, MICHIGAN

( ) DRAFT (X) FINAL ENVIRONMENTAL STATEMENT

RESPONSIBLE OFFICE: U. S. ARMY ENGINEER DISTRICT, DETROIT
P.O. Box 1027, Detroit, Michigan 48231
(313) 226-6762

1. NAME OF ACTION: (X) ADMINISTRATIVE ( ) LEGISLATIVE

2. DESCRIPTION OF ACTION: The Corps of Engineers proposes to mitigate shore erosion in the vicinity of Port Sanilac Harbor, Sanilac County, Michigan, that is attributable to the Federal navigation structures at the harbor. Studies have determined that erosion attributable to the navigation project is approximately 43.0% of the total erosion due to all causes. The plan considered most practical for this purpose entails the creation of a feeder beach and a subsequent periodic nourishment of the area suffering shore damage. Approximately 90,000 cubic yards of fill material will be required initially and 30,000 cubic yards of fill will be required periodically (approximately annually) for an undetermined number of years. The establishment and sustenance of such a beach will provide the quantities of littoral material interrupted by the navigation project to the shores downdrift.

3.1 ENVIRONMENTAL IMPACTS: The provision of a feeder beach and subsequent nourishment would mitigate bluff erosion due to the navigation project by re-establishing a simulated natural pattern of littoral drift. Creating a beach would approach a natural condition that might exist were it not for the navigation project. Decreasing bluff erosion would serve to decrease the turbid water conditions in these areas so the resulting beaches would be aesthetically pleasing as well as useful for recreational bathing and surf fishing.

3.2 ADVERSE ENVIRONMENTAL EFFECTS: The disposition of sand for the project will cause a temporary increase in the turbidity of the water at the operational sites and will affect what bottom-dwelling organisms are in these areas. This effect, however, should be minimal because few bottom-dwelling organisms normally exist in the wave-washed shore area. The only other identified adverse effect is the temporary increase in noise, inconvenience, and dirt levels caused by the construction and transportation operations associated with beach formation.

4. ALTERNATIVES TO THE PROPOSED ACTION: Alternative solutions considered were:

(A) A "Do Nothing" scheme; this attitude would not satisfy the mandate of Section 111 of P.L. 90-483 since it has been established that a portion of the shore damage is attributable to the Federal navigation project.

(B) Removing the harbor structures at Port Sanilac Harbor; this would eliminate recreational boat traffic; littoral drift would resume southward thus affecting the littoral accretion zone north of the harbor containing prime recreational beaches and shore developments.

(C) Shoreland regulation and management techniques; application of such measures will serve to prevent unwise development in areas subject to erosion but will not offer immediate protection to the eroding shoreline.

(D) Partial removal of navigation structures, reduction of project depth, and shoreline management; a significant reduction in project depth would be necessary to allow littoral materials to bypass the harbor, in which case the effectiveness of the harbor for recreational traffic would be restricted or eliminated.

(E) Continuous armor protection with reshaping of the shoreline to a stable angle; this action would deprive the littoral stream of its natural input from bluff erosion so the problem would move downdrift and necessitate additional seawalls; reshaping the bluffs would result in the loss of real estate.

(F) Installation of groins along the damage area; groins on Lake Huron are often effective, but might not be effective south of the harbor structure where littoral drift is insufficient to fill the groins.

(G) Groins artificially filled; could be maintained with annual nourishment by borrow material from a land borrow area.

(H) Offshore breakwaters; such structures would dissipate wave energy, serve to build up a stable bottom profile and form a protective beach; however, such offshore structures are aesthetically displeasing and a hazard to small craft navigation; they would also alter the character of the littoral zone.

(I) Offshore breakwaters and annual beach nourishment; would accomplish more rapidly the preventive measures listed in (H) above.

(J) Protective beaches; nearly identical to the recommended feeder beach approach by serving to restore the littoral drift through the movement of shore currents and wave action; uniform placement of fill material along the beach would be more costly than the stockpile method of placement considered for the feeder proposal.

5. COMMENTS REQUESTED: The Draft and this Final Environmental Statement have been sent to the following agencies or officials for comment:

Advisory Council on Historic Preservation
Federal Power Commission
Great Lakes Basin Commission
Michigan Area Council of Governments
Michigan Department of Commerce
Michigan Department of Natural Resources
Michigan Department of Public Health
Michigan Department of State Highways
Michigan Historical Commission -
Office of Planning Coordinator
Port Sanilac Harbor Commission
State of Michigan, State Archaeologist
State of Michigan, State Historic Preservation Coordinator
State of Michigan, State Historic Preservation Officer
Sanilac County Board of Supervisors
Sanilac County Health Commission
Sanilac County Planning Commission
Sanilac County Road Commission
U. S. Department of Agriculture -
Forest Service
Soil Conservation Service
U. S. Department of Commerce -
National Marine Fisheries Service
National Oceanic & Atmospheric Administration
U. S. Department of Health, Education & Welfare
U. S. Department of Housing & Urban Development
U. S. Department of the Interior -
Bureau of Outdoor Recreation
Bureau of Sport Fisheries and Wildlife
U. S. Geological Survey
U. S. Department of the Interior (National Park Service) for Investigations of Historical, Archaeological and Paleontological Resources
U. S. Department of Transportation -
Federal Highway Administration
U. S. Coast Guard
U. S. Environmental Protection Agency
Village of Port Sanilac
Water Resources Council

6. DRAFT STATEMENT TO CEQ ON 23 MAY 1975.

7. FINAL STATEMENT TO CEQ ON 1 NOV 1976

FINAL
ENVIRONMENTAL STATEMENT

MITIGATION OF SHORE DAMAGE
ATTRIBUTED TO THE FEDERAL NAVIGATION STRUCTURES

AT

PORT SANILAC HARBOR,
MICHIGAN

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MITIGATION OF SHORE DAMAGE
ATTRIBUTED TO THE FEDERAL NAVIGATION STRUCTURES
AT
PORT SANILAC HARBOR, MICHIGAN

1. PROJECT DESCRIPTION

1.01 Section 111 of the River and Harbor Act of 1968 (P.L. 90-483) authorizes the Secretary of the Army, acting through the Chief of Engineers, to investigate, study and construct projects for the prevention or mitigation of shore damages attributable to Federal navigation works. The cost of installing, operating and maintaining such projects shall be borne entirely by the United States. However, no such projects can be constructed without specific authorization by Congress if the estimated first cost exceeds $1,000,000.

1.02 South of Port Sanilac Harbor, the shore of Lake Huron is characterized by erosion. Studies have shown that this erosion problem is partially attributable to the Federal navigation project at Port Sanilac as well as other factors of the normal erosion processes. In recent years, high lake levels have greatly expanded the extent of this problem.

1.03 The Section 111 authority provides only for mitigation of erosion in excess of the natural rate. The authority is not intended to provide mitigation measures of such magnitude as to approach the extent of protection usually associated with the development of regular beach erosion control projects. Factors which may not be mitigated under this authority include the effects of wind and wave action, violent storms, high water levels and normal erosion processes, as well as possible adverse effects from beneficially intended shore protective structures, including man-made changes or adjustments in the shorefront configuration. All these factors were investigated at Port Sanilac Harbor, and it was determined that erosion attributable to the harbor structures in the area of adverse influence is approximately 43.0% of the total erosion due to all causes.

1.04 The proposed plan of improvement, designed to restore a simulated pattern of littoral drift, would provide for an initial placement of 90,000 cubic yards of unpolluted sand fill for a feeder beach plus subsequent periodic (approximately annual or on an "as needed basis") nourishment of subsequent unpolluted sand fill equal to the amount of material (approximately 30,000 cubic yards a year) being interrupted or diverted into deep water by the harbor structures. The periodic nourishment plan, as stated, would give protection to the shore damage area affected by the navigation structures and be within the limits of the Section 111 authority. The initial feeder beach fill would be placed in an appropriate location (as indicated in the following PLAN OF IMPROVEMENT) thus filling private shore protective structures to conditions generally existing prior to construction of the

navigation project. Subsequent nourishment material would be placed at the feeder beach site in an appropriate located stockpile for distribution by natural shore processes. The establishment of a feeder beach with subsequent nourishment supplied periodically at the normal littoral transport rate will allow the quantities of littoral materials interrupted by the navigation project to be restored into the system. Such provision of an initial feeder beach and subsequent nourishment would lessen erosion and establish a simulated natural pattern of littoral drift. The placement and nourishment of the beaches at Port Sanilac may eventually increase the supply of littoral drift to southern Sanilac County areas.

1.05 The beach would be placed such that it would be influenced by shore processes for distribution to the rest of the shore damage area. Accordingly, it has been determined that the beach would be placed such that upon adjustment by wave action, the material will form a protective berm while being dispersed by wave action.

1.06 Initial placement of the feeder beach and several years of periodic nourishment would be required before the area would stabilize. The only erosion that would then occur would be that due to natural processes. Bluff erosion is partially caused by wave action at its toe, dependent on the soil characteristics of the bluff itself and the movement of groundwater through the bluff. Beach nourishment will reduce bluff erosion due to wave action but will not alleviate erosion of the bluff due to groundwater seepage or sheet erosion.

1.07 The design of the optimum fill material is covered in the Section 111 Detailed Project Report on Shore Damage at Port Sanilac Harbor, Michigan.

1.08 The U. S. Army Corps of Engineers utilizes the Unified Soil Classification System. The following grain size-nomenclature table is included for clarity.

TABLE 1

VISUAL DESCRIPTION	BOULDER	COBBLE	Coarse GRAVEL			Fine GRAVEL			
SIEVE		8"	3"	1-1/2"	1"	3/4"	1/2"	3/8"	#3
DIA. IN MM.		203.2	76.14	38.57	25.38	19.03	12.7	9.52	6.8
PHI			-6.25	-5.25	-4.67	-4.25	-3.67	-3.25	-2.77

VISUAL DESCRIPTION	Coarse SAND		Medium SAND			Fine SAND				
SIEVE	#4	#8	#10	#20	#30	#40	#50	#70	#100	#200
DIA. IN MM.	4.76	2.38	2.00	0.84	0.59	0.42	0.297	0.210	0.149	0.074
PHI	-2.25	-1.25	-1.00	0.25	0.75	1.25	1.75	2.25	2.75	3.75

VISUAL DESCRIPTION	SILT					CLAY				
SIEVE DIA. IN MM.	0.05	0.04	0.03	0.02	0.01	0.005	0.004	0.003	0.002	0.0015
PHI	4.32	4.64	5.05	5.64	6.64	7.64	7.96	8.38	8.96	9.38

1.09 The optimum fill material has a mean diameter of .31 mm.

1.10 Volume of fill will have to be adjusted if the beach fill used does not conform to the desired gradation or average specific gravity. If, for instance, the fill material contains too much fine sand, or if the average specific gravity of the fill material is less than the average specific gravity of the original beach material sampled and subsequently used as a basis for calculations and analysis, a greater quantity of fill would have to be provided to insure that the intended beach fill quantities would stay on or near the beach.

PLAN OF IMPROVEMENT

1.11 Some of the erosion along the shoreline of the Village of Port Sanilac and Sanilac Township is a function of a lack of suitable natural beach nourishment. It is believed that littoral materials from beaches to the north, which would normally move southward as littoral drift, are effectively diverted or blocked and retained by the north breakwater. This material then becomes stable, protected within and adjacent to the north breakwater. As a result the eroding area is starved of sand that would normally move back and forth naturally along the shoreline.

1.12 Creation by artificial means of an initial feeder beach with subsequent periodic nourishment has been selected as the most practical plan for mitigating the effects of the navigation project. It is considered that a plan of artificial beach nourishment would establish the shoreline and fill private shore protective structures to conditions generally existing prior to construction of the navigation project. Existing shore protection structures extend for 4,400 feet south of the harbor. Wide armored beaches extend from 4,400 feet to 8,200 feet south of the harbor. Bluff and beach erosion in this area is minimal. The area of severest erosion extends from 8,200 feet south to 13,700 feet south of the harbor (Camp Ozanam). The proposed mitigation plan would provide for initial placement of a feeder beach approximately 150 feet wide, extending from 7,400 feet south to 10,400 feet south of the harbor. The initial feeder beach would contain approximately 90,000 cubic yards of unpolluted sand fill obtained from nearby commercial pits. Subsequent (approximately) annual nourishment would provide 30,000 cubic yards of unpolluted sand along a 2,000 foot long stretch of shoreline between 7,400 feet and 9,400 feet south of the harbor. The feeder beach fill would extend out about 100 feet. A roadside park is located between 8,900 feet and 10,400 feet south of the

harbor. The unpolluted sand fill would be obtained from land borrow areas. The proposed land borrow areas are all commercial pits. Local commercial pits were investigated. The exact pit site or sites for supply will not be decided upon until Plans and Specifications Stage. The source material obtained from land borrow areas could be transported by truck along Highway 25 to Washington Road; then placed over the bluff by a temporary hopper-conveyor system where it would then be spread into place by earth moving equipment. After placement the material would be acted upon by natural currents. Periodic nourishment would be equal to the amount of material interrupted by the harbor.

1.13 This Plan of Improvement would mitigate shore damages caused by the Federal breakwaters. However, improvements would be limited to mitigating the damages that can be directly identified and attributed to the navigation project.

1.14 Lands created by beach nourishment below the ordinary high water mark, 579.6 feet, are administered by the State for public trust. Lands between 579.8 feet and the water's edge are subject to public trust but the riparian has exclusive use to the water's edge. When the lake level is above 579.8 feet, submerged lands above that point are also in the public trust.

1.15 This plan of improvement is designed to only mitigate the effects of the navigation project by restoring littoral transport and providing annual nourishment equal to the amount of material which is interrupted or diverted into deep water.

1.16 Because alongshore transport rates can vary considerably from year to year in response to fluctuations in storm intensities, the initial feeder beach must contain considerably more material than one year's average transport. The variance in transport rates is unknown; therefore, the initial placement-volume choice must be somewhat arbitrary. A placement of about three years' transport was chosen to protect against possible high initial erosion rates while the erosion area stabilizes, as well as to protect against unforeseeable severe storms or series of such storms.

1.17 It is estimated that the initial placement of the 90,000 cubic yards of sand could be accomplished on one construction season (spring, summer, fall) within a period not to exceed 90 days. It is anticipated that periodic (approximately annual) replenishment periods of nourishment of 30,000 cubic yards of unpolluted sand could be accomplished within a period not to exceed 50 days.

1.18 Water quality will be monitored to insure that no degradation occurs in the vicinity of the Port Sanilac Harbor. The Corps will coordinate its proposed action with the local community. The Sanilac County Health Department will be asked to monitor the quality of the water to insure that no degradation occurs in the vicinity of Port Sanilac Harbor. If any variation in acceptable standards are noted during monitoring operations, the Village or County will notify the U. S. Army Corps of Engineers, Detroit District, Saginaw area office and/or the U. S. Coast Guard and/or the Corps Detroit District Office; at which time the Corps mitigation activities will be immediately stopped until corrective action satisfactory to all parties concerned can be initiated.

PLAN IMPLEMENTATION

1.19 The procedure for converting the proposed mitigation plan to a reality can be summarized as follows:

1.20 The District Engineer transmits the findings in this report to the Division Engineer, North Central Division, U. S. Army Corps of Engineers, for review.

1.21 Upon completion of this review, the Division Engineer will transmit the report to the Chief of Engineers. If the Chief of Engineers approves the project, he will request appropriation of funds through the Office of Management and Budget as part of a Budgetary Submission.

1.22 After the Office of Management and Budget has reviewed the Budgetary Submission, the budget is presented to Congress for appropriation of funds.

1.23 Following the appropriation and receipt of funds, construction of the remedial measures by the Corps of Engineers will be initiated. The start of construction is dependent upon the availability of funds.

1.24 After completion of the project, maintenance would be a responsibility of the United States Government.

1.25 No dates have been established for initiation and completion of construction.

DESIGN ANALYSES OF FEEDER BEACH MATERIAL

1.26 An analysis was made (see Section 111 Detailed Project Report on Shore Damage at Port Sanilac, Michigan) to determine the gradation of the existing beach and to apply these findings to determining the gradation of the material that will form a functional feeder beach. The Section 111 Detailed Project Report on Shore Damage at Port Sanilac, Michigan, is available for inspection at U. S. Army Engineer District, Detroit, Corps of Engineers, 150 Michigan Avenue, Detroit, Michigan 48226.

POTENTIAL SOURCES - LITTORAL MATERIALS

1.27 The predominant direction of littoral transport at Port Sanilac being from north to south, would indicate that the majority of littoral material characterizing the littoral zone would be derived from beaches and bluffs north of the harbor.

1.28 It is considered that the grain size of the sediments brought down by the streams would generally be too fine to substantially contribute to the littoral drift pattern.

BORROW AREAS

1.29 Land borrow and offshore borrow areas, including sediments located within the harbor, were considered as potential sources of feeder beach material. It is anticipated that the material selected from any unpolluted approved land borrow area(s) could be graded to satisfy the requirements of optimum fill material for both initial construction and periodic nourishment.

ENVIRONMENT PROTECTION-SCOPE

1.30 The following addresses the furnishing of all labor, materials and equipment and the performing of all work required for the protection of the environment during construction operations except for those measures set forth in other Sections and Subsections of this Final Environmental Impact Statement. It is reflective of the Corps of Engineers Civil Works Guide Specifications for Environmental Protection that will be included under the Technical Provisions, Environment Protection, of any subsequent contract prepared pursuant to implementation of the proposed mitigation plan. The referenced guide specification is prepared for use in all Corps Civil Works construction contracts, other than dredging, and with provisions as appropriate, to eliminate or reduce degradation of the environment during

and resulting from construction operations in consonance with the letter and the spirit of Public Law 91-190, The National Environmental Policy Act of 1969, and Executive Orders 11507 and 11514.

1.31 For clarification, environment protection is defined as the retention of the environment in its natural state to the greatest possible extent during project construction and to enhance the natural appearance in its final condition. Environment protection requires consideration of air, water, and land and involves noise, and solid waste-management, as well as other pollutants. In order to prevent, and to provide for abatement and control of, any environmental pollution arising from the construction activities in the performance of the proposed mitigation plan, any contractor and his subcontractors (if any) shall comply with all applicable Federal, State, and local laws and regulations concerning environmental pollution control and abatement.

PROTECTION OF FISH AND WILDLIFE

1.32 The contractor (if any) shall at all times perform all work and take such steps required to minimize interference with or disturbance to fish and wildlife.

MAINTENANCE OF CONTROL FACILITIES
DURING CONSTRUCTION

1.33 The contractor (if any) shall maintain all facilities constructed for pollution control under the provisions of any contract let pursuant to implementation of the proposed mitigation plan. The contractor's personnel will be required to be familiar with pollution standards, buth statutory and contractual, and methods of detecting and avoiding pollution to prevent and correct environmental pollution.

QUALITY CONTROL

1.34 The contractor (if any) shall establish and maintain a quality control system for all operations performed under contract to assure compliance with contract requirements and maintain records of his quality control for all operations performed, including, but not limited to, the following:

a. Water and Landscape Protection
b. Cleanup
c. Noise, Dust and Smoke Control
d. Waste Disposal Operations
e. Observance of Safety Regulations

QUALITY CONTROL - MONITORING

1.35 Water quality will be monitored to insure that no degradation occurs in the vicinity of the Port Sanilac Harbor. The Corps will coordinate its proposed action with the local community. The Sanilac County Health Department will be asked to monitor the quality of the water to insure that no degradation occurs in the vicinity of Port Sanilac Harbor. If any variation in acceptable standards are noted during monitoring operations, the Village or County will notify the U. S. Army Corps of Engineers, Detroit District, Saginaw area office and/or the U.S. Coast Guard and/or the Corps Detroit District office; at which time the Corps mitigation activities will be immediately stopped until corrective action satisfactory to all parties concerned can be initiated.

1.36 As previously indicated, the proposed land borrow areas are all commercial pits. Local commercial pits were investigated. The exact pit site or sites for supply will not be decided upon until Plans and Specifications Stage. The entire initial fill of unpolluted material and all subsequent unpolluted fill provided by periodic (approximately annual) nourishment will be composed of clean sand meeting Corps design criteria. The fill material will not exceed EPA's and the Corps of Engineers bottom sediment criteria for determining the fill's acceptability for disposal in and along Lake Huron.

RECORDING ANL PRESERVING HISTORICAL AND ARCHAEOLOGICAL FINDS

1.37 Referencing the aforementioned, while the exact pit site or sites for supply will not be decided upon until Plans and Specifications Stage, no pit or pits in the area are listed or pending listing in the National Register of Historic Places. However, in response to the Corps Mandate for Recording and Preserving Historical and Archaeological Finds within its project areas, all items having any apparent historical or archaeological interest which are discovered in the course of any construction activities shall be carefully preserved. The Contractor (if any) shall leave the archaeological find undisturbed and shall immediately report the find to the Contracting Officer so that the proper authorities may be notified.

QUARANTINED AREAS

1.38 The Contractor (if any) will be required to agree that all construction equipment and tools to be used under provisions of contract, prior to being moved from such counties quarantined by the Department of Agriculture to prevent the spread of certain plant pests which may be present in the soil, have been thoroughly cleaned of all soil residues with water under pressure and that hand tools have been thoroughly cleaned by brushing or other means to remove all soil. In addition, if the Contract involves the identification, shipping, storage, testing, or disposal of soils from

such a quarantined area, the Contractor will agree to comply with the provisions of ER (Engineer Regulation) 1110-1-5 and attachments. The Contractor will also agree to assure compliance with this obligation by all subcontractors.

TRANSPORTATION FACILITIES

1.39 Referencing transportation facilities, the Contractor (if any) shall be required to investigate and obtain the necessary information and data as to the availability and use of access roads, highway, and railroad facilities to the site of the work. The Contractor (if any) shall, without additional expense to the Government, be responsible for obtaining any necessary permits to operate on or cross public highways, roads and railroads in connection with the prosecution of the contract work.

DUST CONTROL

1.40 The Contractor (if any) will be required to maintain all excavations, stockpiles, access roads and all other work areas within or without the project boundaries free from dust which would cause any Federal, State or local law pertaining to air pollution to be violated, or which would cause a hazard or nuisance to others.

SMOKE CONTROL

1.41 No combustible waste materials will be burned at the project site. Internal combustion engines shall be tuned and kept in good repair for maximum efficiency to reduce emissions. Boilers shall have proper attention to draft and other controls to reduce smoke.

NOISE CONTROL

1.42 The work shall be conducted in such a manner that noise will not be excessive. Proper mufflers shall be kept in good repair. Work shall be conducted only during regular daylight shifts unless otherwise allowed or specified.

WATERWAYS NAVIGATION AND TRAFFIC

1.43 The Contractor shall acquaint himself with all information and regulations pertaining to navigation and vessel traffic within the waterways at the project site. The Government will not undertake to keep the waterways free from vessels, or other obstructions, except to the extent of such regulations, if any, as may be prescribed by the Secretary of the Army, in accordance with the provisions of Section 7 of the River and Harbor Act approved 8 August 1917 (See Title 33 U.S.C.A. Sec. 1). The Contractor will be required to conduct his work in such manner as to obstruct navigation as little as possible and, in case the Contractor's plant so obstructs a channel as to make difficult or endanger the passage of vessels, said plant shall be promptly moved on the approach of any vessel to such an ex-

tent as may be necessary to afford a practicable passage. Upon completion of the work, the Contractor shall promptly remove his plant, including ranges, buoys, piles, and other marks placed by him under the contract in navigable waters or on shore.

PROTECTION OF WATER RESOURCES

1.44 In general, the Contractor (if any) shall not pollute the lake or channel with fuels, oils, bitumens, calcium chloride, acids, or other harmful materials. The Contractor (if any) shall investigate and comply with all applicable Federal, State, County and Municipal laws concerning pollution of lakes and waterways. Referencing spillages, special measures shall be taken to prevent chemicals, fuels, oils, greases, ashes, sawdust, waste washings, herbicides and insecticides, rubbish or sewage, and other pollutants from entering public waters.

EROSION CONTROL

1.45 Erosion Control procedures (to be developed in detail later during the Plans and Specifications Stage) will be implemented under contract provisions to assure that all construction operations adjacent to and within lake waters shall be performed in such manner as to reduce turbidity in lake waters. Construction of the initial protective beach and subsequent feeder beach would be required to be performed in such a careful erosion control manner so as to eliminate bluff face surface erosion that would contaminate the adjacent lake. Therefore, fill areas shall be constructed by selective placement of unpolluted sand in such a careful manner so as to eliminate any silts and clays from the surface of the bluff face to erode and contaminate or cause turbidity in the adjacent lake.

PROTECTION OF LAND RESOURCES

1.47 In general, the land resources within the project boundaries and outside the limits of permanent work performed under contract shall be preserved in their present condition or be restored to a condition after completion of construction that will appear to be natural and not detract from the appearance of the project. The Contractor (if any) shall confine his construction activities to areas defined by the plans and specifications. The following additional requirements are provided for additional clarification.

BORROW PITS

1.48 If, for any reason, existing commercial borrow pits are found unacceptable for use as source material, and if the Contractor elects to open his own new source pit(s) or a new source pit(s) under lease or other type of contractural agreement, full consideration of environmental impact must be evaluated before borrow operations are started. At the onset of operations, topsoil, if suitable should be saved for use in restoring the site. Not all topsoil is suitable or fertile. Sampling and testing of topsoil should be accomplished where considerable quantities are involved for site restoration. During borrow operations the selected site must be controlled in order to prevent sediment from entering nearby streams and lakes. Restoration of the pits shall include grading, replacement of topsoil and establishment of vegetation cover or other necessary treatments to blend the area into the landscape if the pit(s) will not be continued in operation or used for water recreation. The sides of borrow pits shall be brought to stable slopes with slope intersections rounded and shaped to provide a natural appearance. All rubbish, Contractor's equipment and structures shall be removed from the site if the site will not be continued in operation. Waste piles shall be leveled and trimmed to regular lines and shaped to provide a natural appearance. Where feasible, such waste should be formed in a manner to screen visual intrusions, such as the use of mounds to screen comfort stations. In all instances any restored area shall be well drained so as to prevent the accumulation of stagnant water. If necessary, measures such as diversion channels, dikes and/or sediment traps shall be utilized to prevent sediment pollution of adjacent streams during operations.

PREVENTION OF LANDSCAPE DEFACEMENT

1.49 Except in areas indicated on the plans or specified to be cleared, the Contractor (if any) shall not deface, injure, or destroy trees or shrubs, nor remove or cut them without the authority of the Contracting Officer. Ropes, cables, or guys shall not be fastened to or attached to any existing nearby trees for anchorage unless specifically authorized. Where such special emergency use is permitted, it shall be performed in such a manner as to avoid damage to the trees. The Contractor shall in any event be responsible for any damage resulting from such use. Where the possibility exists that trees may be defaced, bruised, injured, or otherwise damaged by the Contractor's equipment or operations, the Contractor shall adequately protect such trees. Stone, earth or other material that is displaced into uncleared areas shall be removed. Monuments and markers shall be protected before construction operations commence.

RESTORATION OF LANDSCAPE DAMAGE

1.50 Any trees or other landscape feature scarred or damaged by the Contractor's (if any) equipment or operations shall be restored to a condition satisfactory to the Contracting Officer. Restoration of scarred and damaged trees shall be performed in an approved manner by experienced workmen. Trees damaged beyond restoration shall be removed and disposed of. Trees that are removed because of damage shall be replaced at the Contractor's (if any) expense by nursery-grown trees of the same species or a species approved by the Contracting Officer. The size and quality of nursery-grown trees shall also be approved by the Contracting Officer.

LOCATION OF STORAGE AND FIELD OFFICE FACILITIES

1.51 The Contractor's (if any) storage and field office facilities within the project site boundaries shall be in areas so designated for such use and shall require written approval of the Contracting Officer. The preservation of the landscape shall be an imperative consideration in the use of all sites and in the placement or construction of buildings.

POST-CONSTRUCTION CLEANUP OR OBLITERATION

1.52 The Contractor (if any) shall obliterate all signs of temporary facilities such as haul roads, work areas, structures, stockpiles of excess or waste materials, or any other vestiges of construction as directed by the Contracting Officer. The area will be restored to near natural conditions which will permit the growth of vegetation thereon. Except in specific cases, where directed, restoration to original contours will not be required, however, all restored areas shall be smoothly and evenly dressed and sloped to drain.

1.53 Restoring the littoral drift would provide the sand needed to begin natural development of protective beaches along the shore damage area. This would mitigate damage attributable to the Federal harbor structures, replenish the altered littoral environment, improve the long-range turbid condition of the lake near shore, and improve fish and wildlife habitat. The resulting beach would be aesthetically pleasing as well as useful for recreational bathing and surf fishing. Various forms of animal life do exist in the sands along these beaches. However, these populations normally are quite sparse, being subject to various degrees of sand movement and current patterns. The project as proposed, that is the taking of unpolluted sand from select sites and depositing along the beach south of the harbor, is not considered to be detrimental to the beach ecology. The benefits and stabilization of the beach and bluffs are considered to far outweigh any habitat degradation incurred as a result of the proposed project.

ECONOMIC CONSIDERATIONS

1.54 Exact dollar figures calculated for the following Economic Considerations Data can be found in the attached ECONOMIC DATA, EXTRACTED FROM

U. S. ARMY CORPS OF ENGINEERS SECTION 111 DETAILED PROJECT REPORT ON SHORE DAMAGE AT PORT SANILAC HARBOR, MICHIGAN.

ESTIMATED COSTS - TOTAL ESTIMATED FIRST COST

1.55 The estimated first cost of the recommended plan of improvement includes the direct costs for plant, labor, materials, and the indirect costs for engineering and design and for supervision and administration. The estimated first cost of the recommended plan of improvement in the attached ECONOMIC DATA.

ESTIMATED FIRST YEAR NOURISHMENT COST

1.56 For computation purposes the estimated first year nourishment cost is based on providing an estimated 90,000 cubic yards of unpolluted sand for beach nourishment; and may be found in the attached ECONOMIC DATA.

ESTIMATED ANNUAL MAINTENANCE COSTS

1.57 The periodic maintenance will fluctuate from year to year depending upon the quantity of littoral drift retained by the navigation works. For computation purposes the estimated annual maintenance cost is based on providing an estimated 30,000 cubic yards of unpolluted sand for periodic beach nourishment.

ANNUAL COST

1.58 The estimated annual charges for the mitigation measures recommended in this report are summarized in the attached ECONOMIC DATA. The project life is 50 years. The interest rate for the project may also be found in the attached ECONOMIC DATA. The investment costs represent the total first costs for the project less the estimated nourishment costs during the initial year of the project.

ITEMIZED AVERAGE ANNUAL BENEFITS

BENEFITS TO SHORE PROPERTY

1.59 The mitigation measures recommended in the Section 111 Detailed Project Report on Shore Damage at Port Sanilac Harbor, Michigan, would eliminate the tangible and intangible losses caused by the interruption of the littoral drift by the Port Sanilac Harbor breakwaters. The annual loss of shore within the area adversely affected by the breakwaters has averaged approximately 3.1 feet per year.

OTHER BENEFITS

1.60 There are some very important intangible and environmental benefits which would result from implementing the recommendations of this re-

port. The most significant intangible benefits to accrue from the mitigation plan are the reduction of the hazard of possible human injury and reduction of insecurity and mental anguish among residents regarding property and other losses. Restoring the littoral drift would provide the sand needed to begin natural development of protective beaches and provide environmental enhancement along the shore damage area. The considered mitigation plan would mitigate damage attributable to the Federal harbor structures, improve the stability of the littoral environment, improve the turbid condition of the lake, and improve fish and wildlife habitat. The resulting beaches would be aesthetically pleasing as well as providing recreational bathing and surf fishing beaches.

1.61 Recreational benefits have been included in the estimate of tangible benefits for the Section 111 Detailed Project Report on Shore Damage at Port Sanilac Harbor, Michigan. The 1,000 feet of beachfill area (150,000 square feet) to be placed in front of the State Roadside Park will provide an increased recreational potential for the Port Sanilac area. Before the beach in front of the Roadside Park eroded, people used the beach for swimming, sunbathing, picnicking and sightseeing. Due to the lack of public beach facilities in the area, the beach was generally crowded, especially on weekends and holidays. The Port Sanilac Road Commission estimates that an average of about 600 people per day will use the beach between May and October (184 days). Based on a visitor-day value of $0.60, it is estimated that the annual benefits associated with the restoration of this beach area would be $66,320.

BENEFIT-COST RATIO

1.62 The considered plan to mitigate shore damages attributable to the Federal navigation works at Port Sanilac Harbor is engineeringly feasible and economically justified. The selected plan to restore littoral drift yields average annual benefits of $172,920. The benefit to cost ratio is 1.31 to 1.00.

REAL ESTATE REQUIREMENTS

1.63 The costs of any lands, easements, or rights-of-way required for construction or subsequent maintenance will be borne entirely by the United States. All construction activities and filling at elevations about the ordinary high waterline (579.8 feet) will require permanent and temporary easements from the affected owners. Due to the direct benefits resulting from the project, it is considered that the cost of land payments for the fill areas will be minimal. It is expected that most owners will donate the easements. The easements for access will probably require reasonable payment.

2. ENVIRONMENTAL SETTING WITHOUT THE PROJECT

LOCATION AND TOPOGRAPHY

2.01 Port Sanilac Harbor is located on the southwest shore of Lake Huron, about 90 miles north of Detroit, about 30 miles north of Port Huron, and 11 miles north of Lexington. Port Sanilac Harbor, which was built jointly by the State of Michigan and the Federal Government as a harbor of refuge, is also used for basing locally-owned recreational craft, for overnight mooring of transient recreational craft, and for launching trailer-drawn craft. The harbor is also used to a limited extent for commercial fishing craft but no tangible benefits from the improvement are expected to accrue to commercial fishermen.

2.02 Ordinary fluctuations of water levels at Port Sanilac are of the same magnitude and frequency as those that apply generally to other harbors on Lake Huron. Lowest seasonal lake stages prevail during the winter and the highest during the summer. During the five-year period from 1970 to 1974 the maximum monthly mean stage of Lake Huron varied between 4.24 feet above and 1.70 feet above low water datum, for a total fluctuation of 2.54 feet. In the 115 years from 1860 to 1974, the difference between the highest (581.94) and the lowest (575.35) monthly mean stages of the whole period has been 6.59 feet. The greatest annual fluctuation as shown by the highest and the lowest monthly means of any year was 2.23 feet, and the least annual fluctuation was 0.36 feet. In addition there also are oscillations produced by storms, sustained strong winds, and changes of barometric pressure. Except as otherwise noted, the depths stated in this report refer to low water datum for Lake Huron, which has an elevation of 576.8 feet above mean water level at Father Point, Quebec (IGLD 1955). The recreational boating season on Lake Huron extends from June through September, a period of about 120 days.

TRIBUTARY AREA

2.03 The village of Port Sanilac, Michigan, extends for about a mile and a half along the lake front. Its population of about 400 persons is largely dependent on the summer resort and tourist business. Port Sanilac has one manufacturing plant but is without railroad facilities. The nearest railroad service is about seven miles to the west at Carsonville. U. S. Highway No. 25, extending along the lake shore, passes through Port Sanilac. State Highway No. 46 connects Port Sanilac with communities to the west. Medium size farms in the surrounding territory produce a variety of crops, including staple grains and sugar beets.

2.04 Port Sanilac Harbor was included in the recommendations of the Survey of the Coasts of the Great Lakes - Harbors of Refuge for Light-Draft Vessels, which was contained in House Document No. 446, 78th Congress, 2nd Session, dated 11 December 1943 and authorized by the 1945 River and Harbor

Act. This survey recommended harbor sites about 30 miles apart for the larger cruising recreational craft of that era. The nearest Federally improved harbor is located about 30 miles to the north at Harbor Beach. Refuge is also available in the St. Clair River and in the Black River at Port Huron, about 30 miles to the south. Proposed intermediate harbors such as at Lexington and Forestville would be available for smaller cruising recreational craft and provide bases for local boats. Lexington is about 11 miles south and Forestville 17 miles north of Port Sanilac Harbor. Congress has authorized construction of harbors at both of these locations.

2.05 As previously indicated, for about 13,700 feet south of Port Sanilac Harbor the shore of Lake Huron is intermittently characterized by severe erosion. The shoreline is protected by an almost continuous seawall and numerous groins for 4,400 feet south of the harbor. Were it not for these structures valuable property would be lost and homes threatened, as evidenced by those few lots that are not protected. From inspection of aerial photos it appears there is an insufficient supply of littoral materials to become trapped by the groins. As a result these works have been only partially effective and shore erosion has continued.

2.06 Littoral materials along the reach are being lost to longshore drift to the south. The harbor is partially blocking and retaining the supply of sand which would naturally nourish the shoreline. This lack of nourishment from the north, and continued loss of beach and bluff from the reach south of the harbor is resulting in erosion.

2.07 The shoreline between 4,400 feet south and 8,200 feet south of the harbor is protected by cobble and boulder beaches which prior to breakwater construction were sandy. The rest of the shoreline (approximately 5,500 feet) is intermittently eroding where clay bluffs are being undercut.

2.08 In recent years high lake levels have greatly expanded the extent of the erosion problem caused by the navigation structures and normal erosion processes.

2.09 The predominant direction of littoral transport at Port Sanilac is from north to south and the material characterizing the littoral zone indicates that the majority is derived from the beaches and bluffs north of the harbor.

2.10 Materials supplied by the streams emptying into Lake Huron within the study area are presently of an insignificant quantity and are considered too fine to contribute to the nourishment of the beaches.

2.11 Various forms of animal life exist in the sands and near shore areas along these beaches, however, these flora and fauna populations normally are quite sparse, being subject to various degrees of sand movement, turbidity, wave action and current patterns. Erosion of the beaches and clay bluffs results in a turbid lake condition as the silt and clay size

fraction of the bluffs is carried in suspension in the littoral stream. The unstable bluff faces are steep and nearly void of vegetation and therefore provide little shelter for animal life.

2.12 The serious erosion of the bluff and loss of beach to the south of Port Sanilac Harbor has prohibited the use of most of this beach area. Waterfront recreational facilities, such as docks and stairways, cannot be maintained and fail. Without stairways, there is no safe accessibility to the water's edge because the bluff slope is very steep and even vertical in some places. The turbid condition of the lake along this eroded shoreline makes the lake undesirable for water recreation.

2.13 Lake Huron has an area of 23,100 square miles. It is approximately 223 miles in length and 101 miles wide with its main axis in a north-south direction. The maximum recorded depth is 750 feet. Low water datum for Lake Huron is elevation 576.8 feet above mean water level at Father Point, Quebec in the Gulf of St. Lawrence. Net flow between Lakes Michigan and Huron at the Straits of Mackinac is into Lake Huron. The St. Marys River flows into Lake Huron from Lake Superior, along the eastern end of Michigan's Upper Peninsula. Outflow from Lake Huron is at Port Huron at the southern tip of Lake Huron where the source of St. Clair River is located.

WAVES

2.14 Reliable Great Lakes wave data measured by wave gauges are nearly nonexistent for statistical treatment. An indirect method of developing wave data is "wave hindcasting" which employs various mathematical relationships between meteorologic data to predict wave heights and periods. The Department of Meteorology and Oceanography of the University of Michigan developed "Wave Statistics for Lakes Michigan, Huron, and Superior" using wave hindcasting procedure developed by Sverdrup, Munk, and Bretschneider as explained in CERC Technical Report No. 4 (1966). Meteorologic data for 11 Great Lakes stations were collected for the three-year period, 1965-1967. Wave heights and periods were given showing hours of duration each month from each of 16 directional quadrants for the three-year period, and their totals. Their hindcasting procedure assumed the following: (a) wind of less than 10 knots produces waves with negligible wave heights (i.e., 0.5 feet); (b) all waves were deep water waves with no correction for shallow water; and, (c) the existence of ice cover was ignored.

LITTORAL CURRENTS AND DRIFT

2.15 Generally, the predominant direction of littoral currents and drift along the shoreline of Sanilac County is north to south as indicated by the accumulation of material to the north of the harbor structures at Port Sanilac, and smaller individual structures both north and south of the harbor entrance.

METEOROLOGY

2.16 The dominant meteorological factors are winds, waves, and water level variations. The winds and waves are directly responsible for sediment movements and fluctuations of water levels separate the regimes of the two areas affected, namely the backshore above the waterline and the foreshore below the waterline.

WINDS

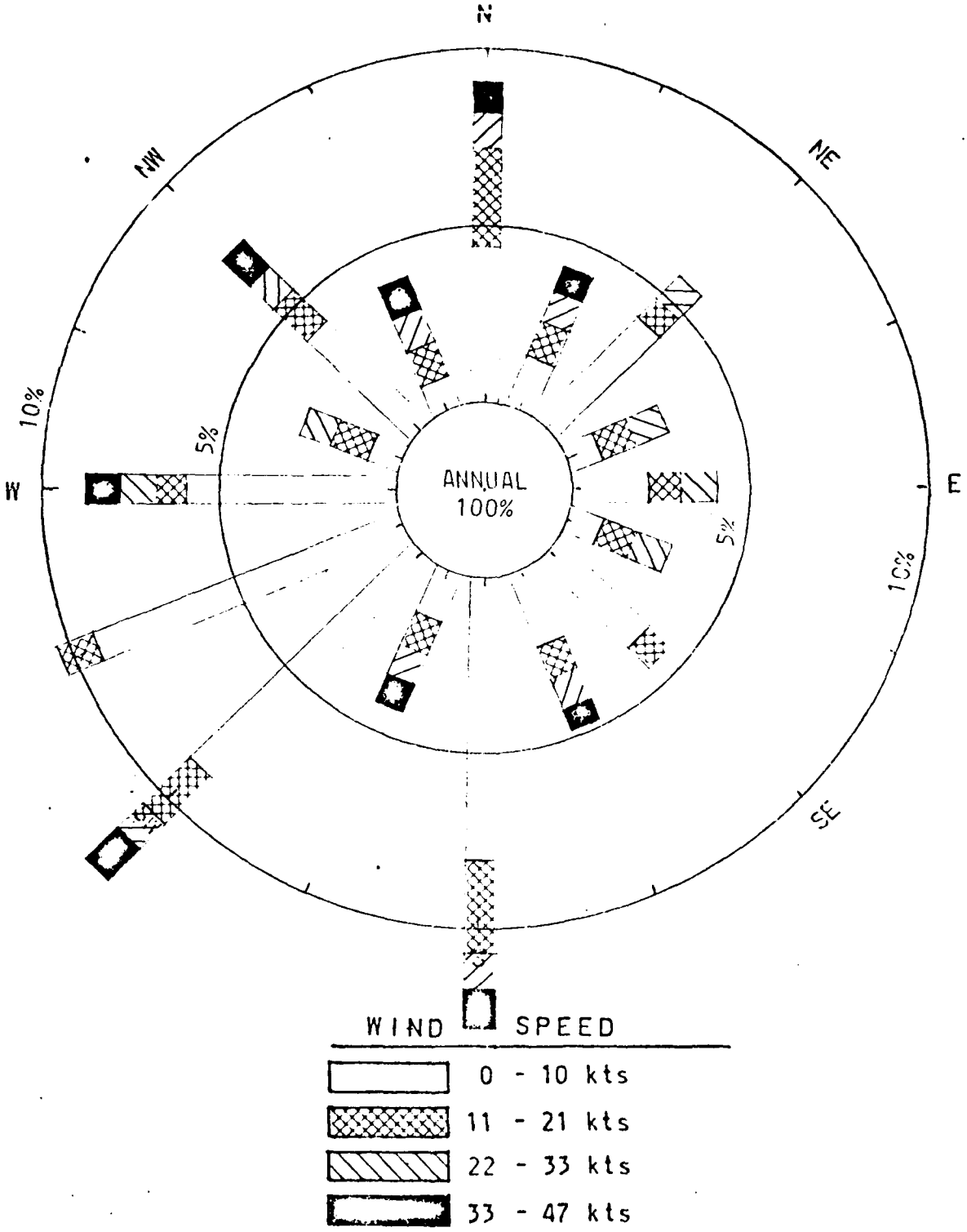
2.17 Winds are a dominant force affecting the Port Sanilac area. The winds produce a number of major and minor effects: (a) They are the generating force for waves; (b) they cause lake level changes; (c) they transport sand across the beaches, particularly the finer sediment sizes. Wind data over the lake are available from ship reports. The southern half of Lake Huron (south of 44°30'N) has a total number of observations over 25,000, covering the period from 1960 to 1973. These data have been summarized in Figures 1 and 2 for the year and for the normal ice-free period, respectively. There is a significant seasonal variation of wind regime which is summarized in the data presentation of Figure D.8 of the Detailed Project Report, available for review at the Detroit District Office. Although the wind data indicate more winds from the south and west, the longer fetch distances from the north and northeast across Lake Huron allow larger waves to develop than those that can develop over the shorter fetches from the south, southeast, and west. Accordingly, greater wave energy is directed to the south thereby accounting for the discrepancy between the wind and wave data as presented in figures D.6, D.7, D.9, and D.10 of the aforementioned Detailed Project Report.

WIND TRANSPORT

2.18 Beach sands present at many harbors will respond to dominant winds. If these dominant winds blow onshore the net sand transport will be inland. Along a shoreline having narrow beaches the extent of inland transport is limited by bluffs. The eolian transport accretes against the base of the bluffs and is then returned to the littoral stream during high lake levels. A wide beach in front of the bluffs provides a storage area for the eolian transport which is then lost from the littoral stream. Eolian transport of beach material is not a significant factor in the Port Sanilac area for two reasons: (a) the beach material is not of suitable size for wind transport and the bluff material is dominated by clays which are little affected by wind, and (b) the dominant winds blow offshore in the Port Sanilac area.

STORMS

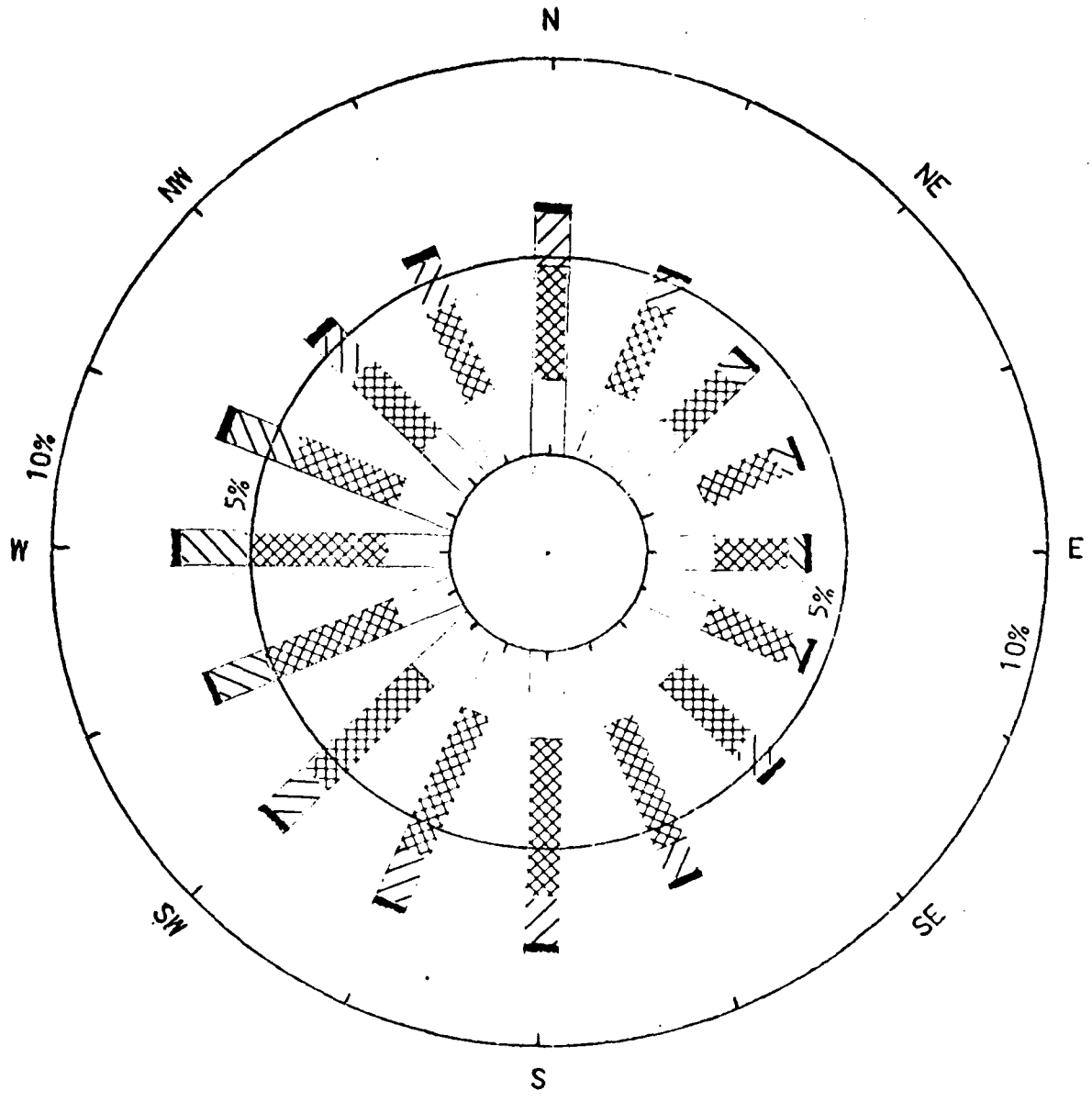
2.19 The more sustained and vigorous wind storms generally occur when the air mass contrasts are the greatest and pressure fields more intense.



WIND ROSE FOR AN AVERAGE 12-MONTH PERIOD

Data from SSMO for Southern Lake Huron, 1965-1967

FIGURE - 1



WIND SPEED

- 0 - 10 kts
- 11 - 21 kts
- 22 - 33 kts
- 33 - 47 kts

WIND ROSE FOR AN AVERAGE MINIMUM ICE-FREE PERIOD OF 9 MONTHS
Data from SSMO for Southern Lake Huron, 1963-1973

FIGURE 2

This is usually from fall through spring. The summer months are the calmest period of the year although short duration storms such as those associated with squall lines or thunderstorms do occur.

ICE CONDITIONS

2.20 Lake Huron in the vicinity of Port Sanilac is usually ice covered during winter and early spring. The ice cover usually consists of closely packed ice at mid-season during a normal winter. During a severe winter with maximum ice cover, the shoreline of Sanilac County is bound by a consolidated ice pack. During a mild winter the shoreline is characterized by open and closed packs due to the rapid response to currents and changing wind conditions.

2.21 The ice acts as a wave absorber and dissipates wave energy before it can strike the beach. Shifting ice abrades the beach and damages shore protective structures.

LAKE LEVELS

2.22 The average elevation of the Lake Huron surface varies irregularly from year to year. During the course of each year, the lake surface is subject to seasonal fluctuations with the lowest stages usually prevailing during the winter months and the highest during the summer months.

SHORE HISTORY

2.23 Shoreline changes in the vicinity of Port Sanilac Harbor, Michigan, were determined from comparisons of the following data.

2.24 Detailed field investigations were conducted to delineate the influence of the piers on the shoreline to develop a mitigation plan. Field investigations made in the study area consisted of profiles of the beach, bluff and nearshore area out to approximately the 30-foot contour on profiles north of the harbor, and out to approximately the 20-foot contour on profiles south of the harbor. Surface samples were taken in the bluff, backshore, foreshore, and nearshore area (approximately at the 5, 10, 15, 20, 25, and 30-foot contours) along the profiles.

2.25 Office studies consisted of an analysis of collected field data and other available pertinent data, such as prior reports, maps, charts and aerial photographs, to determine the amount and areal extent of influence of the navigation structures on the shoreline, character of beach material, littoral movement, rate of supply and loss of littoral materials, hydraulics of Lake Huron and the appropriate mitigation measures.

PRIOR CORRECTIVE ACTION, EXISTING STRUCTURES & A GENERALIZED DESCRIPTION OF SHORE SEGMENTS WITHIN THE STUDY AREA

2.26 There is a great variation in the types of shore protection along the shore damage area. Private individuals have constructed numerous structures with little or no coordination. The result has been that in many cases properties adjoining those protected have been eroded to such an extent that protective works have been flanked. The lack of littoral drift along the shore damage area has resulted in groins being ineffective and necessitating increased maintenance of protective structures. A generalized description of the shoreline including the extent of protective works within the study reach follows:

MOUTH OF LIENS CREEK TO PORT SANILAC HARBOR

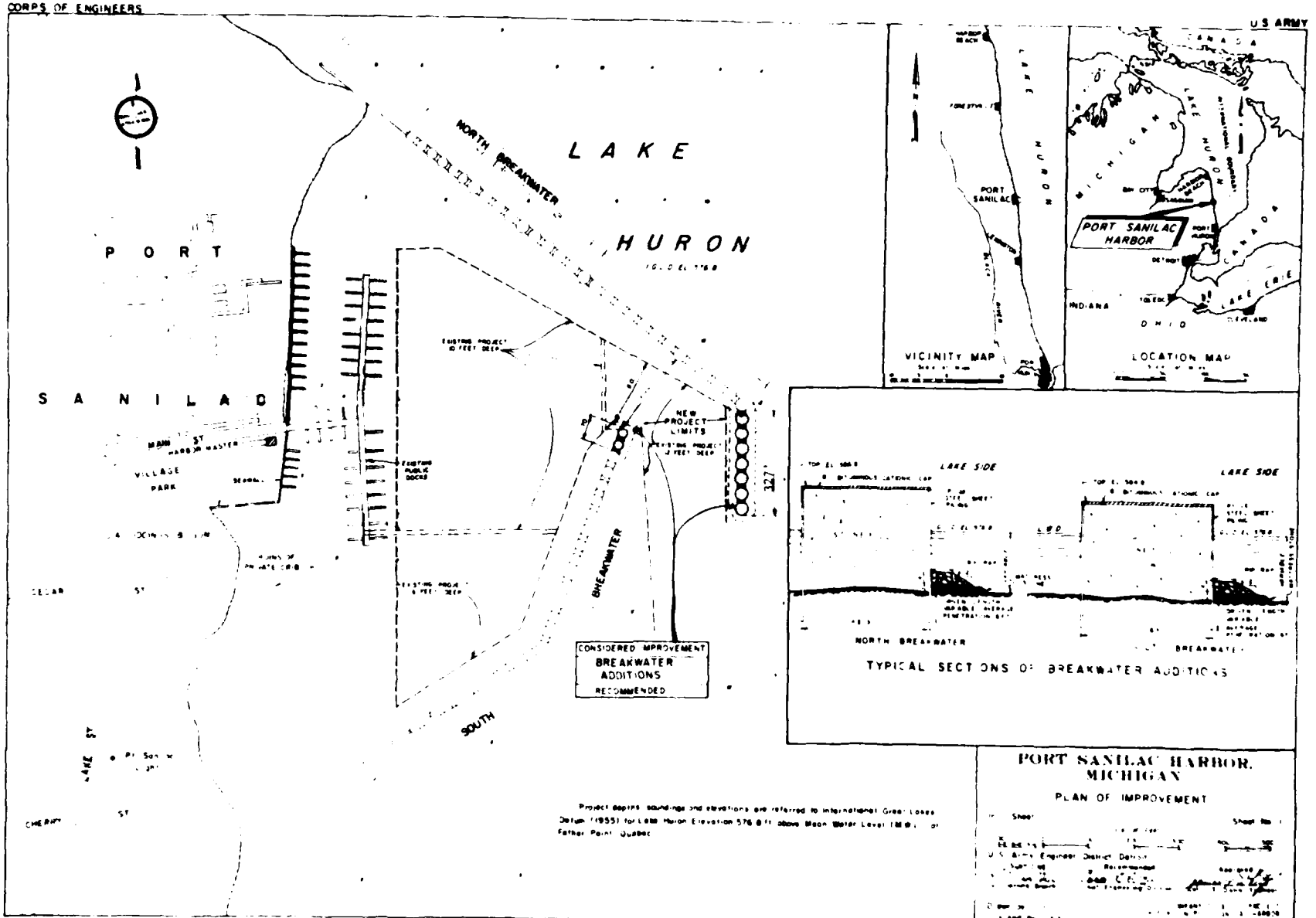
2.27 This portion of the Lake Huron shoreline (see Plate 7, Photo A, and Plate 3) approximately 1,300 feet in length, extending from the mouth of Liens Creek which is just south of the northern Port Sanilac village limit, to the north breakwater of the harbor has a relatively low elevation. The beach averages approximately 8 feet above low water datum and widens progressively from 40 feet at the mouth of Liens Creek to 275 feet wide adjacent to the north breakwater. A comparison of aerial photos taken prior to breakwater construction (May 1951), June 1961 and 26 August 1970, and a condition survey made August 1955, shows substantial accretion of littoral materials along the entire reach. Prior to breakwater construction the average beach width along this reach was approximately 60 feet. Section D of the north breakwater (see plate No. 1) was in 3 to 5 feet of water at the time of construction and by the 1955 condition survey accretion had established a beach 2 feet above low water datum and adjacent to section D within the harbor. The area of accretion within the north breakwater appears to have been relatively stable since 1955. The beach northward to Liens Creek was not included in the 1955 condition survey so the only basis for comparison is the aerial photos. However, it is considered that the beach has been stable because of the stability of the sands within the harbor. It is believed that since 1955 littoral materials being carried from north to south are deposited lakeward from section D due to turbulence in the semicircular area formed by the area of accretion at the end of section D.

PORT SANILAC HARBOR TO HYDE ROAD (SOUTH VILLAGE LIMIT OF PORT SANILAC)

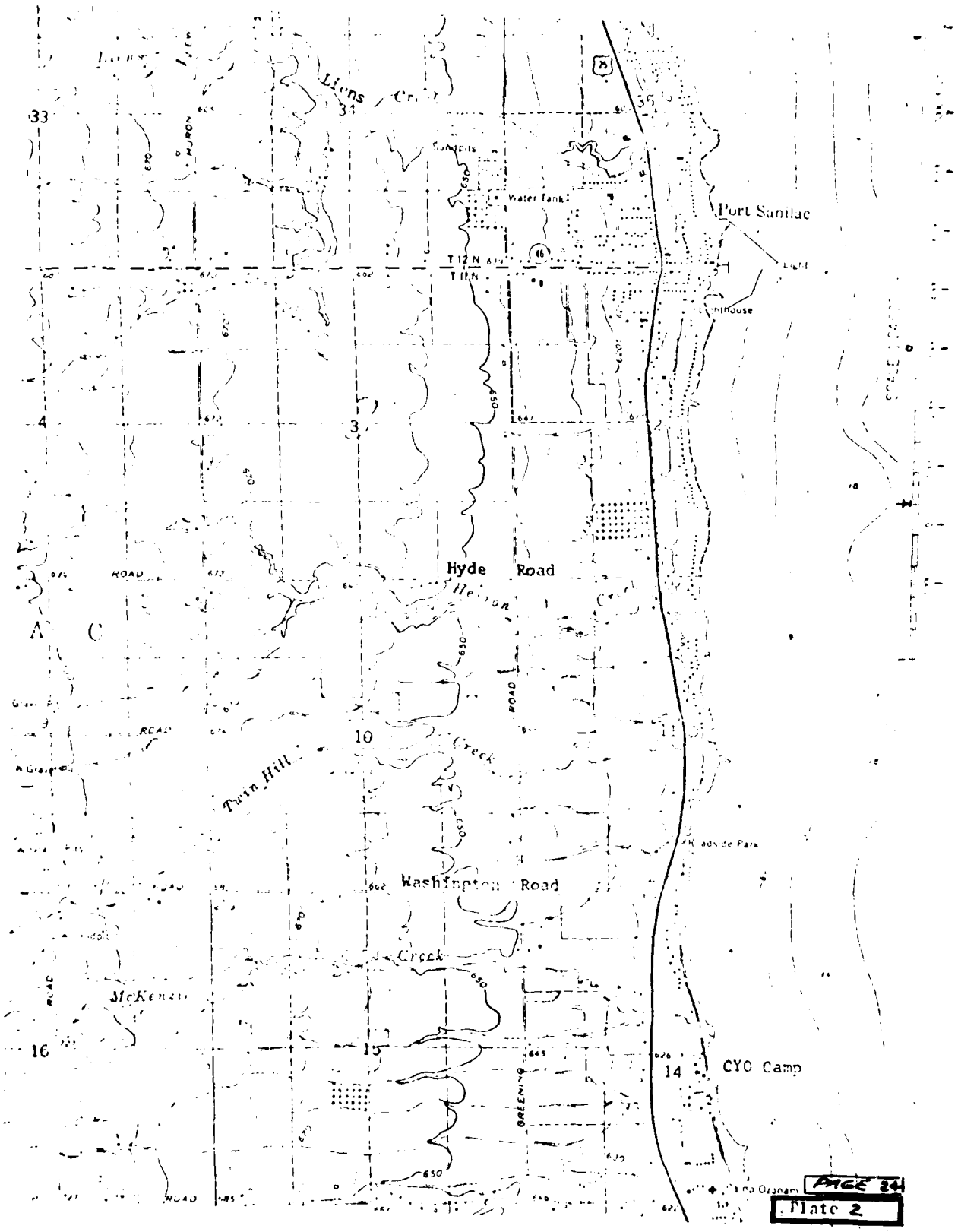
2.28 This reach of Port Sanilac shoreline, (see Plate 7, Photos B and C, and Plate 3) approximately 4,400 feet in length is characterized by low sandy bluffs approximately 20 feet high, underlain by a very hard blue clay near the water line. However, this reach is protected by an almost continuous sea wall of varying types constructed by individual property owners. In

CORPS OF ENGINEERS

U S ARMY



PAGE 23 PLATE 1


Lions Creek
Port Sanilac
Water Tank
Lighthouse
T12N
T11N
Hyde Road
Heinon
Creek
Twin Hill
Washington Road
McKenzie
CYO Camp
ROAD
GREENING
HURON
PAGE 24
Plate 2

addition there are numerous wood and steel sheet pile groins all of which are about 45 feet in length. The seawalls and resistant clay has prevented serious bluff loss. However at various points where the seawalls have been undermined, or where there are no protective structures, serious erosion and bluff loss has resulted. Almost all shore protective structures were built after Port Sanilac Harbor was constructed. There is no beach except for an area 500 feet long at the southern end of the reach near Hyde Road where it is composed of coarse gravel and boulders. It is considered that were it not for the seawalls, erosion would have caused, and currently be causing, serious damage. However, the seawalls cause agitation at their bases, the result being a complete loss of beach. The groins may be too short to retain the existing long shore drift or there simply may be no drift to be retained because of blockage on the harbor structures. Groins are so closely spaced that wave energy is concentrated into a small area causing a turbulence which would carry any littoral materials present lakeward. Prior to breakwater construction the beach was approximately 60 feet wide. The extensive seawall construction, with probable backfilling, altered the shore making it impossible to determine the amount of bluff loss. However beaches have been lost as evidenced by aerial photos prior to construction.

HYDE ROAD TO 1,000 FEET SOUTH OF
THE MOUTH OF TWIN HILL CREEK

2.29 The shoreland along this reach (see Plate 7, Photo D, and Plate 3) is approximately 3,800 feet in length. The beach is characterized by gravel and cobbles and is approximately 25 feet wide. The beach is of sufficient width and slope to protect the bluff from wave action. However, aerial photos taken prior to breakwater construction show a substantial sandy beach along this area of shoreline.

FROM 1,000 FEET SOUTH OF THE MOUTH OF TWIN HILL CREEK
TO THE CATHOLIC YOUTH ORGANIZATION CAMP

2.30 This reach of shoreline (see Plate 8, Photos E, F, G & H, and Plate 3) approximately 5,500 feet in length has steeply sloping clay bluffs up to 40 feet high composed of clay till with boulders and gravel. On the updrift side (north) of the shore protective structures and at the mouth of McKenzie Creek are gravel and sand beaches. The rest of the shoreline is characterized by the previously mentioned boulder-clay bluffs which are being undercut by wave action with subsequent slumping. The result is a loss of valuable bluff property.

SHORE PROCESSES

2.31 The Lake Huron shore of Sanilac County is of glacial or lacustrine origin, the present shore formations being associated with the extensive variation of the lake level during the glacial era. Existence of the clay or sandy till bluffs in the area can be associated with a long-term pattern of wave erosion and recession of the shore. Much of the material

composing beaches fronting the bluffs is supplied by wave erosion of those bluffs. High lake levels in recent years have inundated protective beaches and accelerated the erosion rate of the bluffs.

SEDIMENT BUDGET & LITTORAL DRIFT

2.32 A littoral drift analysis of the Port Sanilac area has been made using photographs and condition surveys. Based on these data, an estimate of the volumetric amount of littoral drift moving north to south has been made. Following completion of Port Sanilac Harbor in 1951 sediment began depositing in harbor and along the beaches to the north. A tombolo began forming at this time, also. By 1955 the tombolo had connected with the breakwater reducing the shoaling in the harbor. After formation of the tombolo, currents were generated along the north breakwater which carried the longshore transport lakeward. Some of this deposit may have been later carried south and finally returned to the downdrift shore at Camp Ozanam. It appears this process is continuing today (see Plate 4). A deposit is overdeveloping lakeward of the entrance to the harbor that serves as the source for the material being moved downdrift. Plate 9 shows sediment being moved along the north breakwater.

2.33 Shoaling lakeward of the north breakwater has reduced since the formation of these currents. But the beaches north of the harbor are still accreting.

2.34 Calculations based on surveys in the Port Sanilac area indicate that 11,000 yd^3/yr accreted along the beaches from Liens Creek to the north breakwater prior to stabilization of the tombolo. The harbor and tombolo trapped another 16,000 cubic yards annually during this time and another 3,000 cubic yards were deposited annually lakeward of the north breakwater.

2.35 Aerial photographs indicate that the tombolo has been stable since 1955 and that the current along the breakwater has been a dominating factor since then. Consequently, the tombolo is accreting no longer. The beaches north of the structures appear to be accreting at the reduced rate of 1,000 cubic yards annually. The area lakeward of the north breakwater is accreting for another 1,000 cubic yards annually. The deposit lakeward of the harbor entrance is growing at the rate of 6,000 cubic yards annually. In addition, the sediment analysis done in 1972 indicates that about 4,800 cubic yards annually are fine sediments which would be carried farther lakeward and, thus, lost to the littoral environment permanently. As indicated in the preceding paragraph, about 30,000 cubic yards of material is moving in the vicinity of Port Sanilac, thus, it appears that about 17,200 cubic yards may be being entrained and moving along the offshore bar between Port Sanilac and Camp Ozanam about 3.1 miles south. In the zone of influence (from Port Sanilac Harbor to Camp Ozanam), calculations contained in the Port Sanilac Harbor Section 111 Detailed Project Report show that 28,400 cu yds/yr are eroded from the bluffs. The sediment analysis of the 1972 and 1973 surveys indicates that, on the average, 48% of the material

eroded is lost to deep water or about 13,750 cu yds annually. Thus 14,650 cubic yards of material are available for littoral transport annually. Plate 5 illustrates the sediment budget for the area.

2.36 The source of the littoral materials is the sandy beaches to the north of Port Sanilac. There are several small streams to the north of the harbor but they are not capable of velocities sufficient to carry sand from inland watersheds to the lake.

EROSION RATES

2.37 As previously indicated, based on volumetric erosion rates, the percent of erosion attributable to Port Sanilac Harbor has been calculated to be 43%. The erosion zone of influence of the harbor was calculated to be from soil sampling profile line number 3, located immediately south of the harbor, southward 13,700 feet to soil sampling profile line number 17, located on the north side of Camp Ozanam. The control zone utilized for the volumetric erosion calculations consisted of the shoreline reach from soil sampling profile line 18 (located 16,368 feet south of line 3) southward to soil sampling profile line 20 (located 19,008 feet south of line 3); and the shoreline reach from Applegate Road (located 32,208 feet south of line 3) southward to Burns Line Road (located 77,790 feet south of line 3). Based on recession rates, calculations indicate that average recession rates in the zone of influence equal 3.1 ft/year. Based on recession rates, calculations indicate that average recession rates in the control zone outside the zone of influence equal 2.22 ft/year. Based on volumetric erosion rates, calculations indicate that average volumetric erosion rates in the zone of influence equal 4.0 cu. yds./year/lineal ft. Based on volumetric erosion rates, calculations indicate that average volumetric erosion rates in the control zone outside the zone of influence equal 2.8 cu. yds./year/lineal ft.

2.38 Total nearshore erosion attributable to the Federal navigation project is about 12,212 cubic yards per year. Total nearshore erosion is 28,400 cubic yards per year. Thus erosion attributable to the navigation project is only 43% percent of erosion due to all causes.

OTHER EROSION FACTORS CONSIDERED

2.39 Factors that were considered which may not be mitigated under Section 111 are the effects of wind and wave action, violent storms, high water levels and normal erosion processes, as well as possible adverse effects from beneficially intended shore protective structures, including man-made changes or adjustment in the shorefront configuration. These factors were weighed, as previously indicated, and it has been concluded that the aforementioned accounts for 57.0% of the total erosion in the project area.

PLATE 3 BOTTOM CONTOURS IN THE VICINITY OF PORT SANILAC, MICHIGAN

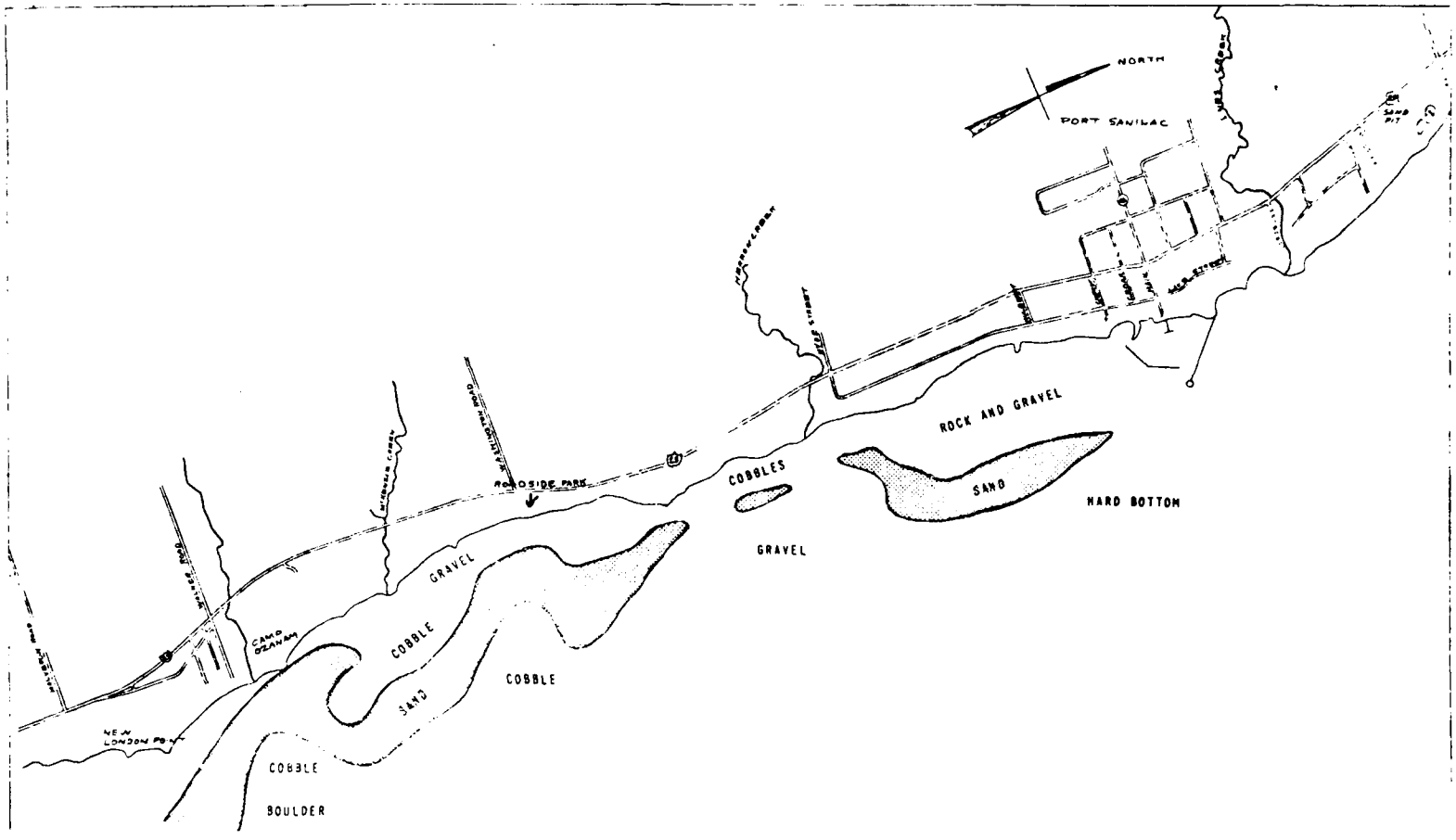


PLATE 4 SEDIMENT DISTRIBUTION IN THE VICINITY OF PORT SANILAC

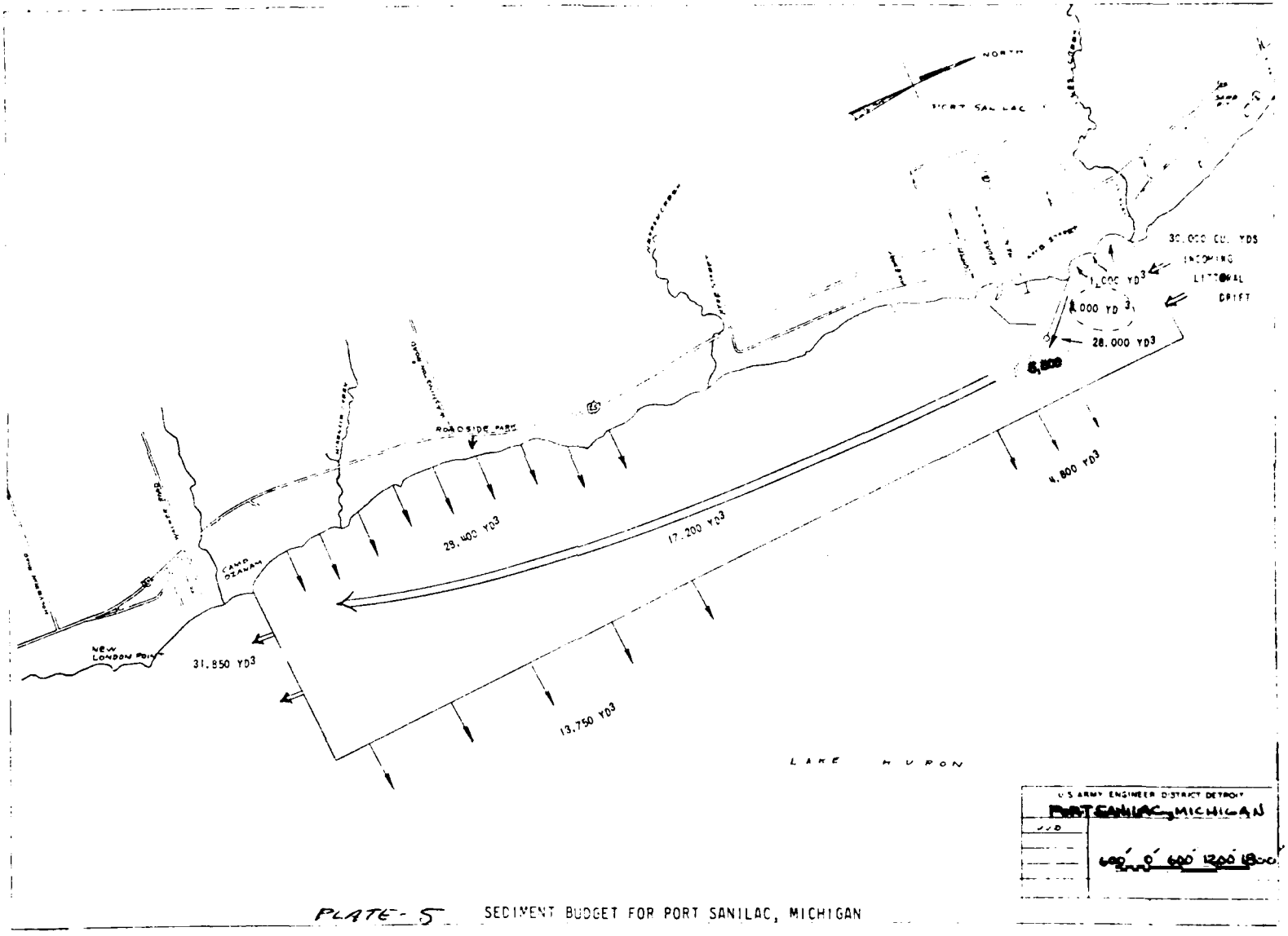
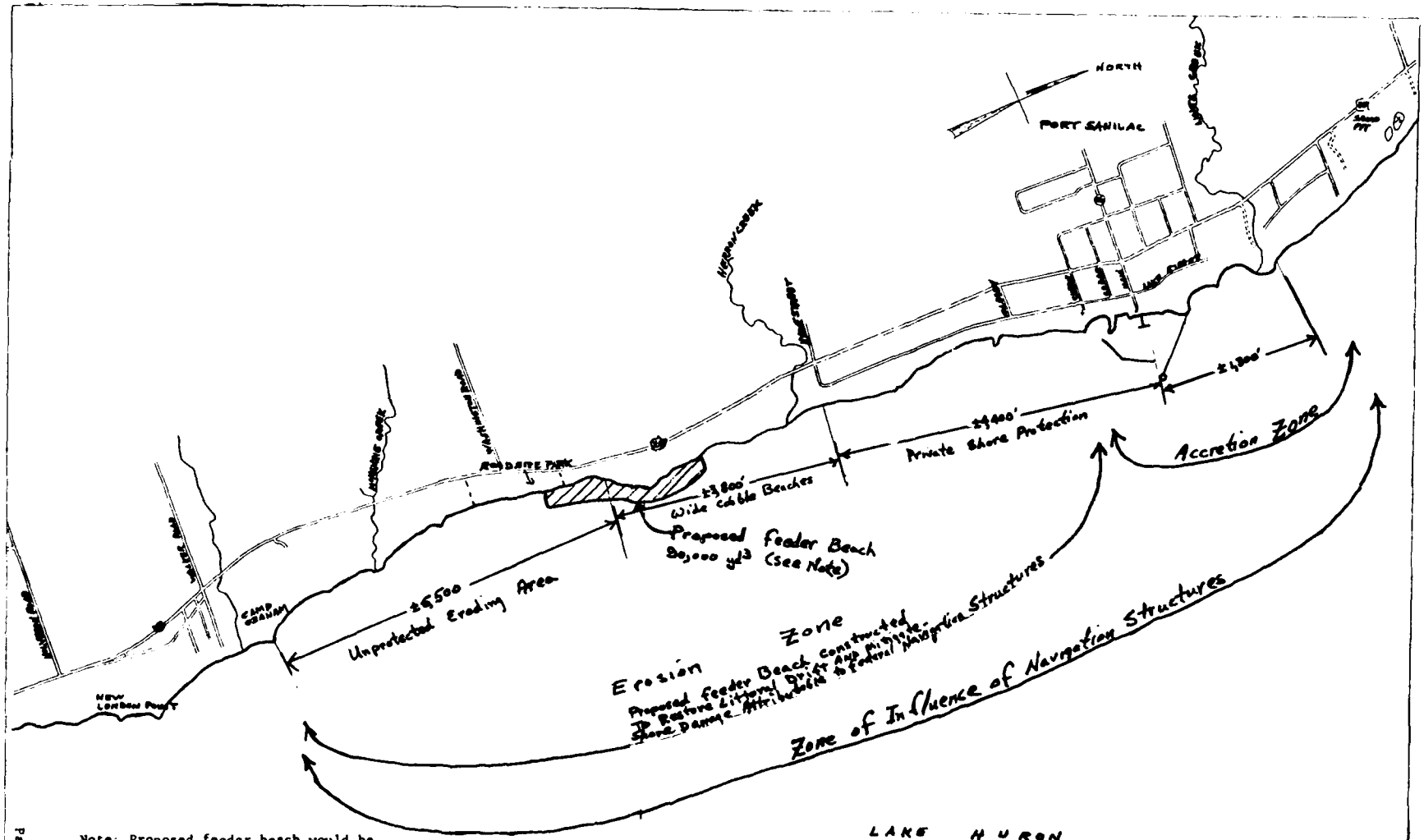


PLATE - 5 SEDIMENT BUDGET FOR PORT SANILAC, MICHIGAN



Note: Proposed feeder beach would be supplied by sand from a land source.

Initial Placement of ≈90,000 cu.yds.
Periodic Placement of ≈30,000 cu.yds.

U.S. ARMY ENGINEER DISTRICT DETROIT
Port Sanilac, Michigan
JJD
0 200' 400' 800' 1200'

PLATE-6 Feeder Beach Location

A

Approximately 160 ft. south of S.S. line 4, looking south. Note seawalls and groins.

Approximately 180 ft. north of soil sampling line 1, looking south toward Port Sanilac Harbor.

B

S.S. line 6, looking northwest.

C

S.S. line 9, looking south. Note armor beach.

D

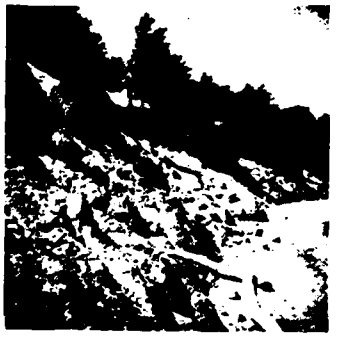
PLATE.7 Views Showing Shoreline Conditions on Lake Huron south of Port Sanilac Harbor, Michigan (June, 1973) See Plate 3, Bathymetry Map of Port Sanilac for reference to locations of soil sampling lines.

E

Approximately 130 ft. south of S.S. line 11, looking south of eroding bluff by Roadside Park.

F

Approximately 230 ft. north of line 12, looking north at shorline by Roadside Park.



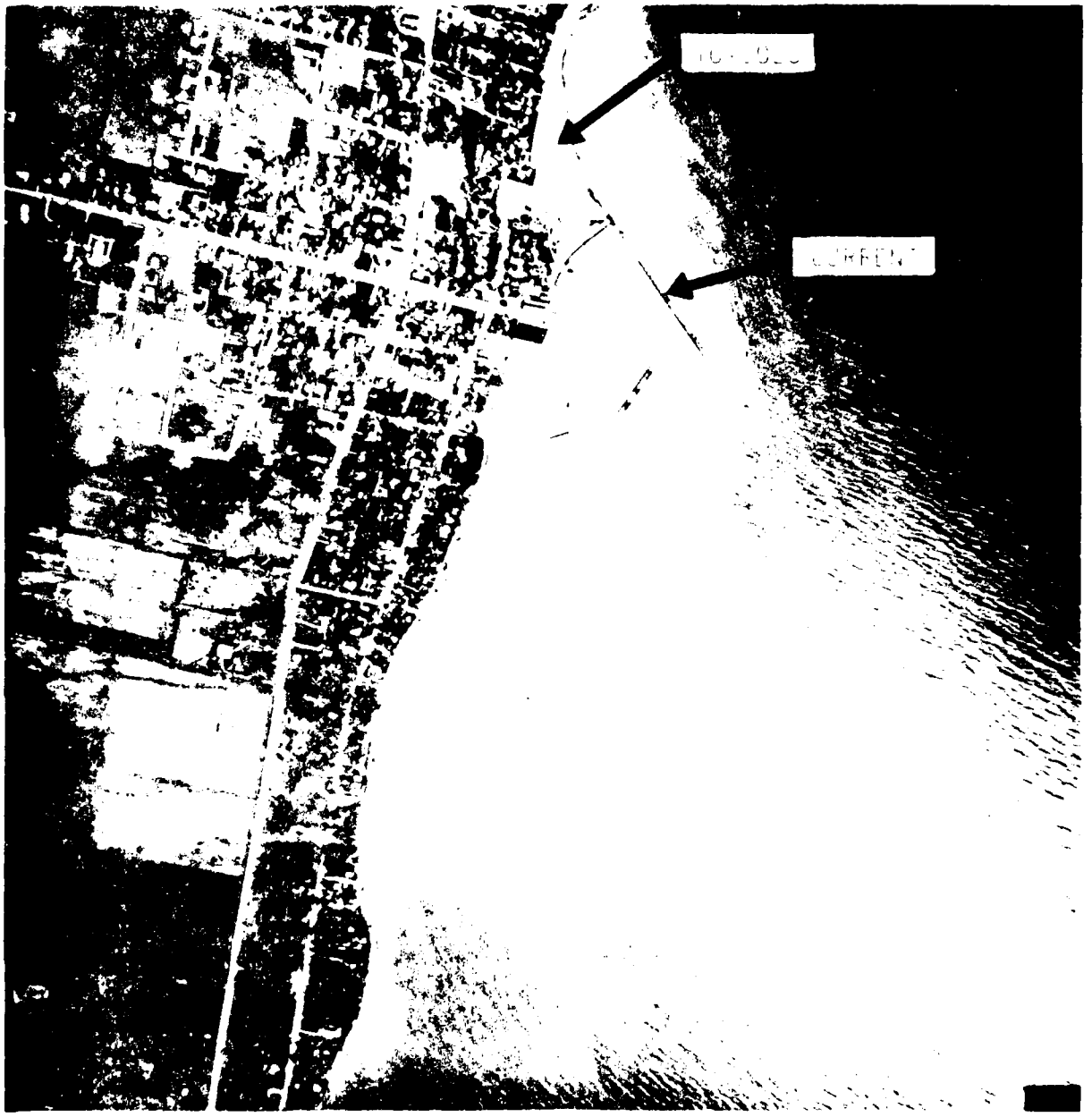
S.S. line 15 looking north. Note vertical bluffs and exposed well.

G

S.S. line 17, looking northwest at 90 ft. wide sand, gravel and cobble.

H

PLATE.8 Views Showing Shoreline Conditions on Lake Huron south of Port Sanilac Harbor, Michigan (June, 1973) See Plate 3, Bathmetry Map of Port Sanilac for reference to location of soil sampling lines.



...otograph of Port San Luis Harbor, ... taken in April 1974, showing the ... and the current carrying sediment ... north breakwater.

BOTTOM SEDIMENT ANALYSIS AND POLLUTION OF THE HARBOR

2.40 Based on sampling conducted in 1975, EPA has classified all sediments in the harbor as acceptable for unrestricted open lake disposal. Sampling done in 1970 found the sediments composed of ooze and sand, and high in volatile solids, chemical oxygen demand, and phosphorus. Sampling done in 1972 and 1974 found the sediments composed of ooze and silt, and high in chemical oxygen demand and nitrogen. Sediments outside the harbor are composed of clean sand. Sampling done in 1975 found sediments in Port Sanilac Harbor consisting of sand with a very substantial silt and clay fraction. The finer particles make up between 45% and 72% of the sediment. (See Appendix A.)

2.41 Major past sources of pollution have been craft discharges and sewage from the Village of Port Sanilac. Recently, however, both of these sources have been controlled. Pump-out facilities for craft holding tanks were operational in January 1971 and their use was enforced. A $500 fine for discharging wastes from boats is enforced in the harbor. Sewage discharged from the Village of Port Sanilac was mostly the result of municipal sewer overflows into the storm sewer system which flowed into the harbor. A new lagoon sewer system scheduled for completion in 1973 has been built in the northwest section of the Village of Port Sanilac and will separate the two systems. The sewage overflow will no longer empty into the harbor. Any overflow will discharge 0.8 miles south of the harbor. The storm sewer outlet will remain unchanged. With these major sources of pollution controlled, prospects for continued increased water quality in the harbor are improved.

2.42 Natural causes probably contributed to the development of some polluted sediments in the harbor. The decay of plant growth within the relatively quiet, warm waters of the harbor adds to the organic ooze of the harbor bottom. Accumulation of bottom sediments other than the original sand is increased by the reduction in wave action and water circulation by the harbors breakwaters.

POPULATION

2.43 According to the U. S. Department of Commerce, Bureau of the Census publication: U. S. Census of Population; 1970 NUMBER OF INHABITANTS Final Report PC(1)-A24 MICHIGAN, the 1970 population of the Village of Port Sanilac was 493; the Township of Sanilac, 1,652; and Sanilac County, 34,889. These population figures represent an increase from 1960 of approximately 36.6%, 33.8% and 8% respectively.

USE OF THE HARBOR

2.44 Commerce at Port Sanilac Harbor has consisted of recreational craft and a few commercial fishing boats. Commercial fishing receipts

listed in Table 2 were taken from annual issues of Waterborne Commerce of the U.S. Waterways and Harbors, Great Lakes - Part 3. Compiled under the supervision of the Division Engineer, U.S. Army Engineer - Division Lower Mississippi Valley, Corps of Engineers, Vicksburg, Mississippi.

TABLE 2

WATERBORNE COMMERCE REPORTED AT PORT SANILAC HARBOR

Year	Commodity	Tons
1960	Fresh fish, except Shellfish	103
1961	" " "	138
1962	" " "	86
1963	" " "	69
1964	" " "	0
1965	" " "	16
1966	" " "	1
1967	" " "	1
1968	" " "	0
1969	" " "	3
1970	" " "	8

2.45 Recreational boating facilities at Port Sanilac Harbor consist of 30 transient slips, roadside moorage for eight transient boats, 10 seasonal slips, and bridled moorage for four transient and 12 seasonal boats. Recreational boating statistics furnished by the Michigan State Waterways Commission are listed in Table 3.

TABLE 3

RECREATIONAL BOATING STATISTICS

	Number of Boats Using Harbor			
Year	Cruisers	Sailboats	Total	Number of Persons
1967	636	57	693	2,555
1968	832	53	885	3,117
1969	1,167	46	1,213	4,471
1970	1,087	62	1,149	3,869
1971	929	145	1,074	3,749

2.46 Relating prospective traffic to a description and history of the Federal Navigation Project, in accordance with Section 107 of the 1960 River and Harbor Act, a plan of improvement (with accompanying Final Environmental Impact Statement - issued February 1973) has been recommended

to reduce the size of storm waves entering the existing harbor by adding a 70-foot extension to the south breakwater and a 327-foot arm to the north breakwater. The aforementioned harbor improvement will benefit locally-based and transient recreational craft by providing increased protection from damaging storm waves to the inner harbor. As of December 1974, the aforementioned project contract had been awarded; however, due to a delay in the delivery date of steel from the manufacturer, the contractor has been given a time extension on his completion date.

2.47 The proposed breakwater improvement is not expected to affect existing commercial fishing boat traffic and the number of trailer-drawn boats being launched. However, because of the proposed breakwater improvement, the locally-based fleet should increase by about 15 boats within 10 years after the breakwater improvement and an additional 15 boats within the following 40-year period. Annual transient craft visits should increase by about 1,000 within five years after the breakwater improvement and another 2,000 within the following 45-year period. Port Sanilac, being an original 30-mile interval harbor of refuge, would be a likely stop for craft proceeding northerly from Port Huron. Lexington, which is approximately half-way between Port Sanilac and Port Huron, would be more likely to be by-passed by the larger craft because of its proximity to Port Huron. Forestville, 16 miles north of Port Sanilac, would be too far from Port Huron to be a first stop. The Michigan State Waterways Commission is planning additional dock spaces to accommodate these increases which will accrue from harbor improvement.

DESCRIPTION AND HISTORY OF FEDERAL NAVIGATION PROJECT

PORT SANILAC HARBOR, MICHIGAN
CONDITION OF IMPROVEMENT, 30 JUNE 1973

2.48 PROJECT: This harbor is located on the southwest shore of Lake Huron, 30 miles north of Port Huron, Michigan. The existing project was authorized by R&H Act of March 2, 1945. This provides for a harbor of refuge protected by breakwater structures extending to 12-foot contour in Lake Huron; and an entrance channel 12 feet deep and a harbor basin about 65% of which is 10 feet deep and the remainder 6 feet deep. The lengths of the north and south breakwaters are 1,230 and 949 feet, respectively.

2.49 PROGRESS: Existing project was completed in 1951.

2.50 CONTROLLING DEPTHS BELOW IGLD (1955): Controlling depths of 12 feet and 6 feet are available within the entrance channel and anchorage area, respectively.

STATUS OF AUTHORIZED
BREAKWATER EXTENSIONS
AT
PORT SANILAC HARBOR, SANILAC COUNTY, MICHIGAN
DECEMBER 1974

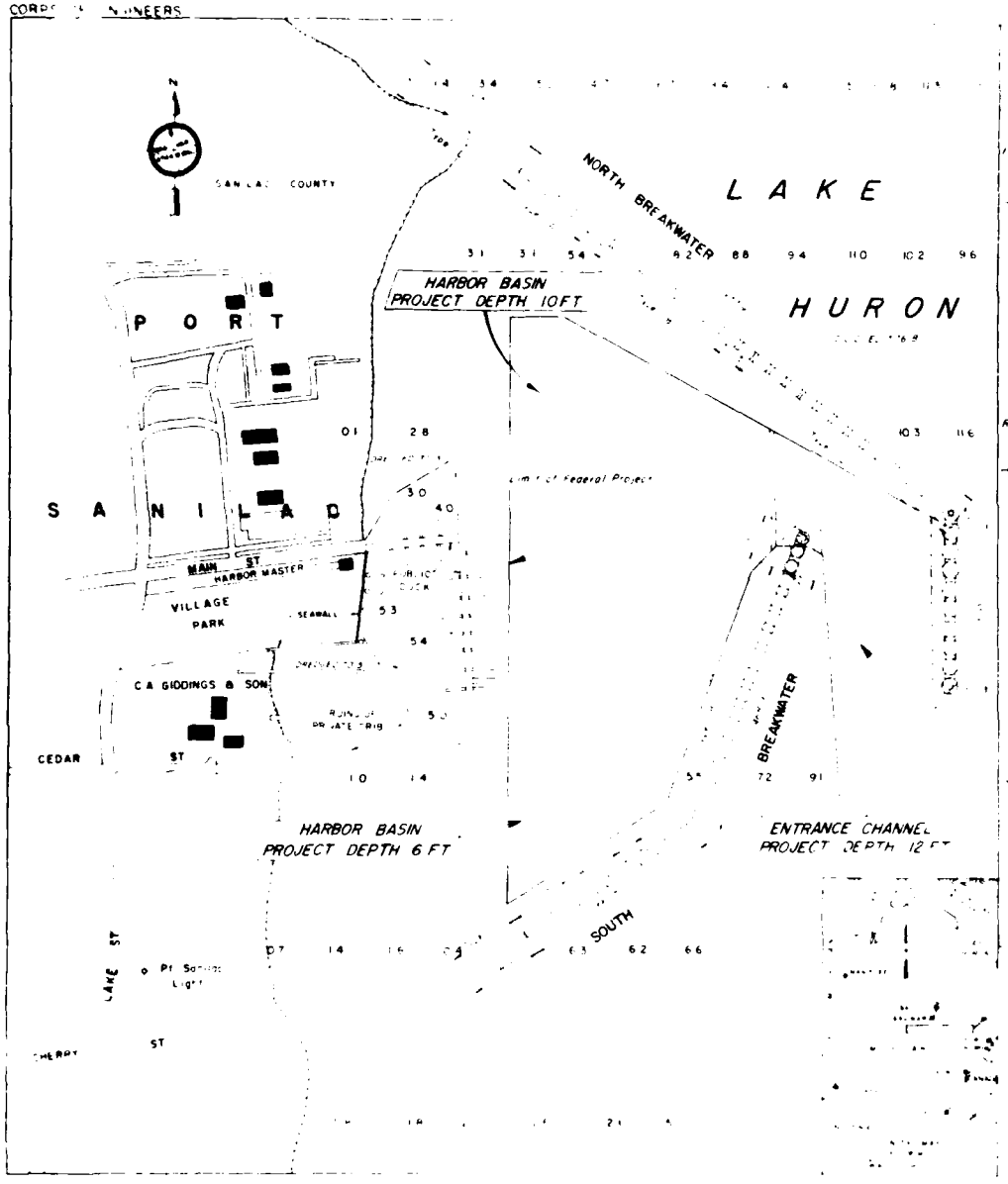
2.51 DESCRIPTION OF ACTION: In accordance with Section 107 of the 1960 River and Harbor Act, a plan of improvement was recommended to reduce the size of storm waves entering the harbor by adding a 70-foot extension to the south breakwater and a 327-foot arm to the north breakwater (see Plate 10.

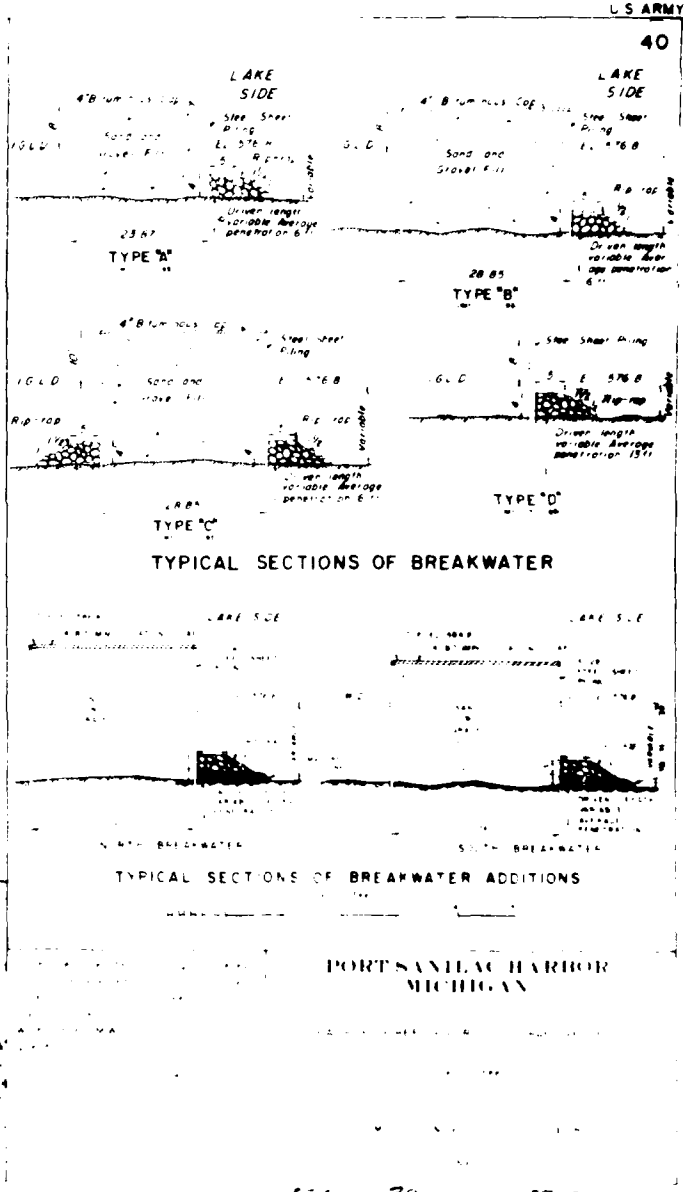
2.52 As previously indicated, as of December, 1974, the aforementioned project contract had been awarded; however, due to a delay in the delivery date of steel from the manufacturer, the contractor has been given a time extension on his completion date.

GEOLOGY - (GEOMORPHOLOGY)
LAKE HURON BASIN MORPHOLOGY

2.53 The basin morphology of Lake Huron is generally well known. It is clear that the structure of the basin axis follows the structural trend of the rock units striking southeast to south and dipping southwest to west toward the center of the Michigan basin (see Plate 11). It is generally recognized that the major Niagaran escarpment of Silurian rocks, separates Georgian Bay from the main Huron basin. In general, two major linear ridges of parallel resistant bedrock units outcrop on the basin bottom. These ridges are represented by the Roger City and Dundee formation and the Traverse Group of Upper Devonian time. A flatter southeastern basin is generally underlain by Mississippian shales and sandstones. In the northeastern basin between the Niagaran escarpment and the subparallel ridges on the bottom, the topography is quite uneven, which is a result of collapse structures from the solution of salt in the upper Silurian Salina Formation.

2.54 The most recent glacial age (Wisconsin) shaped Lake Huron and the other Great Lakes to the approximate shapes we know them today. The basin now occupied by the waters of Lake Huron was a former river valley, a path of lesser resistance for glacial advance, which was deepened and broadened by glacial erosion. When the climate became warmer, the ice melted and retreated forming a lake at the south end of the Lake Huron Basin called Lake Saginaw. Lake Saginaw's surface was about 100' higher than the present lake level. This oldest form of Lake Huron drained between end moraines in the Thumb area of Michigan, eventually flowing down the Grand River Valley. When this outwash river emptied into the early Lake Michigan (known as the Glenwood stage) the sediments formed a large delta in the vicinity of Allendale, Michigan.





PORT SANILAC HARBOR
MICHIGAN

39

Fig. 39 Plate 10

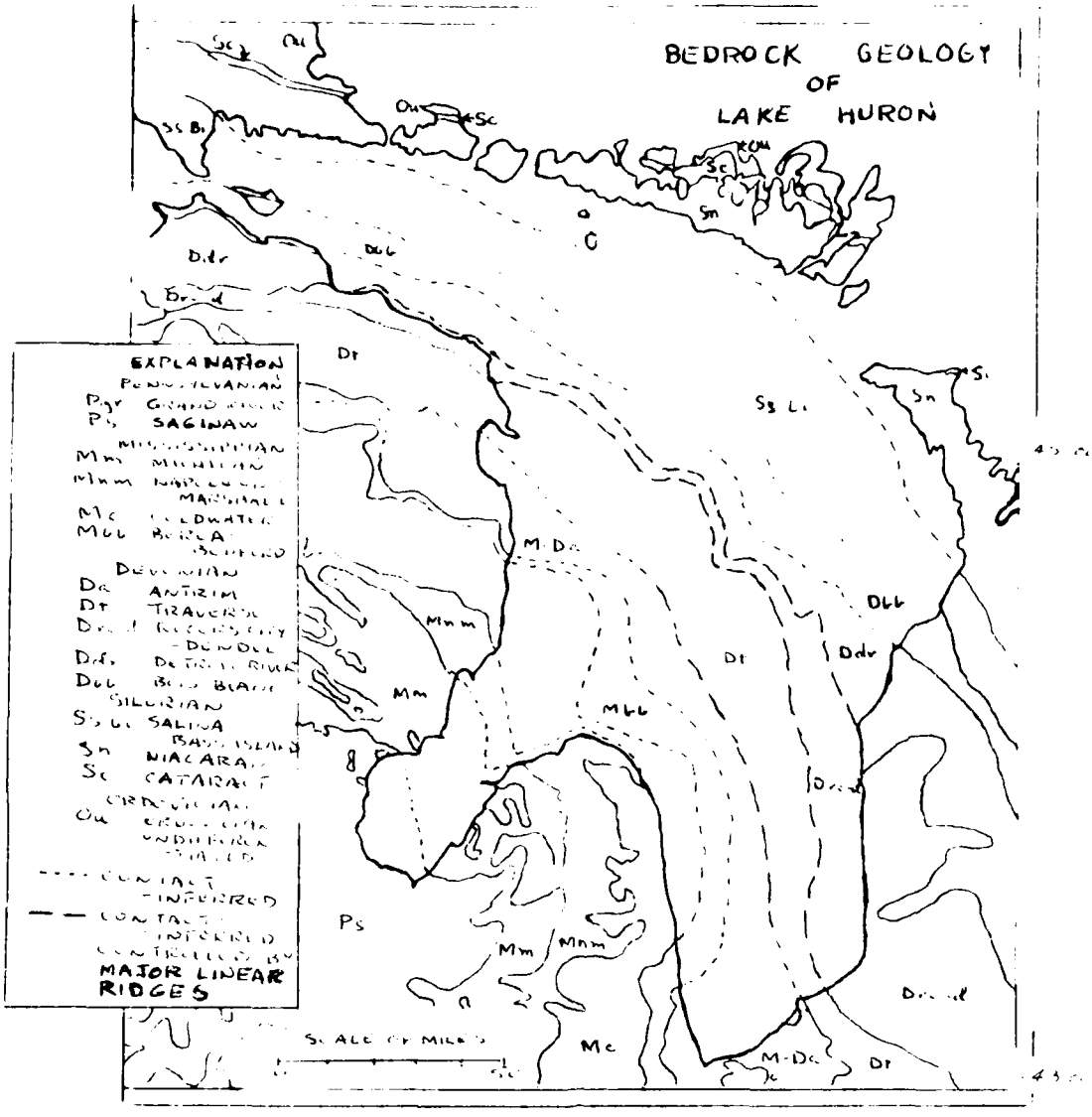

BEDROCK GEOLOGY
OF
LAKE HURON
EXPLANATION
PENNSYLVANIAN
Pgr GRAND RIVER
Ps SAGINAW
MISSISSIPPIAN
Mm MICHIGAN
Mnm NAPOLEON
MARSHALL
Mc COLDWATER
Mdl BEREA
BEDFORD
DEVONIAN
Da ANTRIM
Dt TRAVERSE
Dml ROGERSCITY
DUNDEE
Ddr DETROIT RIVER
Dbl BOIS BLANC
SILURIAN
Ssl SALINA
BASS ISLAND
Sn NIAGARAN
Sc CATARACT
ORDOVICIAN
Ou CINCINNATIAN
UNDIFFERENTIATED
CONTACT
INFERRED
CONTACT
INFERRED
CONTROLLED BY
MAJOR LINEAR
RIDGES
SCALE OF MILES
Ou
Sc
Sm
Dt
Ps
Mm
Mnm
Mc
M-Da
Ddr
Dml

PLATE -11

2.55 The ice advanced again for a short period of time and again retreated, this time Lake Arkona was formed. The surface of Lake Arkona was at 710 feet above sea level or about 130 feet above present Lake Huron lake levels. Lake Arkona covered both the southern Lake Huron Basin and the Lake Erie Basin. The outlet for this lake was again by way of the Grand River. Following several lake level changes the ice readvanced for the last time and formed the Port Huron morainic system, which can be traced, with few breaks, from Minnesota to New York. Following the retreat of this ice glacial Lake Warren was formed at a level of 690 feet and occupied the southern Lake Huron Basin and the Lake Erie Basin. As before, Lake Warren also drained by way of the Grand River into glacial Lake Chicago (Glenwood Stage).

2.56 As the ice continued to retreat, the Lake Huron Basin emerged and drained westward. There were several lake level changes during this time, but the trend was downward. Finally, the glacier retreated far enough to allow the Lake Huron Basin to drain directly into the Lake Michigan Basin. The connection between the two lakes (Grassmere stage in Huron and Glenwood stage in Michigan) was somewhere in the vicinity of the present Mullet and Burt Lakes and the Indian River. This connection resulted in a great discharge through the Chicago outlet of the Glenwood Stage of glacial Lake Chicago. This channel was soon cut to bedrock and the lake levels stabilized. This level is called glacial Lake Lundy and the Calumet Stage of glacial Lake Chicago in the Huron and Michigan Basins, respectively. Their common level was 620 feet.

2.57 The lake levels dropped again, this time stabilizing at 605 feet, forming glacial Lake Algonquin in both basins. The basins were connected by a broad strait covering much of Emmet, Cheboygan, and Presque Ile counties and drained through the Chicago outlet and the St. Clair River. AS the ice continued to retreat successively lower outlets were discovered resulting in the Kirkfield low water stage (565 feet). This was followed by the Valders advance of the glacier which cut off the two basins again causing the lake levels to rise. This new Algonquin stage in Lake Huron returned the lake level to 605 feet.

2.58 As the glacier retreated, this time to leave the area permanently, lower outlets were again found (at North Bay and the Trenton Lowland) causing Lake Huron to drop to its lowest stage ever, Lake Stanley at 190 feet. Lake Chippewa was the low stage of Lake Michigan at 230 feet. The two basins were connected by a river flowing through the present Straits of Mackinac. The deep gorge formed by this river is now completely drowned. As the land surface rebounded from the tremendous weight of the glacier, the lower outlets were abandoned reopening the Chicago and St. Clair outlets. The lake levels rose to the Nipissing stage (605 feet). The Chicago outlet was rapidly cut down to a resistant sill; thus, the St. Clair outlet became the only outlet for the Upper Lakes. The levels at this time were at 595 feet in the two basins and these levels marked the Algoma stage. The lake levels again dropped to their present 579 feet where they have been for

the past 3,500 years, an extremely long time considering the complex history of these lakes.

2.59 The high lake levels are important because they caused the shore features present in the Port Sanilac area. For about 1.5 miles south of Port Sanilac Harbor the Nipissing shoreline forms a bluff several hundred feet landward of the present shoreline. Farther south, Lake Huron is directly attacking the Nipissing bluff and the escarpment at the water's edge is correspondingly higher.

2.60 Where the Nipissing shore is not being attacked, the beach near Port Sanilac is characterized by a bluff 20 feet high composed of sand with varying amounts of clay and a beach 30-35 feet wide at low water datum composed of fine sand to medium gravels with a variable amount of sand. Since the harbor was installed, the beach south of the harbor lost most of its sand and has become very rocky.

2.61 Where the Nipissing shore is being attacked, the beach is characterized by a bluff 40 feet high composed of clay till with boulders, gravel, and sand and a beach about 20 feet wide at low water datum composed of gravel, cobbles, and boulders.

LITTORAL MATERIALS

2.62 The dominant materials in the nearshore and bluff areas are comprised of glacial sediments of medium to fine sands. The volume of sandy material in the beach prism appears to be generally small and, in fact, the beach prism in most areas consists of cobbles and coarse gravel. However, there is an extensive and stable beach at Camp Ozanam composed of mainly medium to fine sands. In some places glacial till crops out on the denuded bluff faces.

2.63 The median sediment size for the north bluffs is 0.29 mm (1.78Ø) as compared to 0.65 mm (0.62Ø) for the offshore. The median size for the bluffs in Reach 2 is 0.2 mm (2.34Ø) as compared to 0.09 mm (3.51Ø) offshore. In reach 3 the median size in the bluffs is 0.05 mm (4.33Ø) and 8.89 mm (-3.15Ø) offshore. In reach 4 the median sizes are 0.11 mm (3.22Ø) in the bluff and 0.17 mm (2.53Ø) offshore. Detailed calculations are included in Appendix 2 of the Port Sanilac Section 111 Detailed Project Report available for review at the Corps Detroit District Office, 150 Michigan Avenue, Detroit, Michigan 48226. Since the supply of littoral material from major inland runoff at Port Sanilac is negligible, the principal source of littoral material is concluded to be the beach and the bluff.

2.64 Sediment samples were taken in June 1972 and June 1973, within an area approximately 1,200 feet north to 19,000 feet south of Port Sanilac Harbor and including bluffs, backshore, foreshore and nearshore zones to as far out as 2,500 to 3,500 feet from shore. Two lines were located north and 18 lines south of the harbor. A thorough analysis and tables showing

the results of and testing of the surveyed area are given in Appendix 2 contained in the aforementioned Detailed Project Report. A generalized sediment distribution map is given in Plate 4. A bathymetry map of Port Sanilac is given in Plate 3. Summaries of mean diameters and sorting coefficients are presented in Figures D.3-D.5 of the Detailed Project Report for Port Sanilac Harbor Section 111 proposed mitigation plan available in the Corps Detroit District Office.

2.65 The offshore sediments at Port Sanilac are generally coarse (gravel and cobbles). However, there is a lens of sand running offshore from just south of Port Sanilac Harbor to Camp Ozanam (13,700 feet south) where it rejoins the beach. This sand is littoral material diverted by the structures at Port Sanilac. The sand is found at depths between 5 to 10 feet below LWD.

HISTORICAL AND ARCHAEOLOGICAL SITES

2.66 During 13-16 June 1973, a reconnaissance by Corps staff identified no historical, archaeological or paleontological site or sites within the proposed project site. Ongoing rapid erosion of the predominantly clay creating new bottomlands precludes finding old shipwrecks located on older bottomlands. Since most of the project would be on submerged lands, there are no known prehistoric Indian sites known for the immediate project area. The National Register of Historic Places, including the most recent supplements (which are published on the first Tuesday of every month), has been consulted and no National Register properties will be affected by this project.

2.67 In the case of land or property under the control or jurisdiction of the Federal Government (the Federal harbor structures), the proposed undertaking will not result in the transfer, sale, demolition, or substantial alteration of potential National Register properties.

2.68 While no non-federally owned or controlled districts, sites, buildings, structures, and/or objects of historical, archaeological, architectural, or cultural significance exist in the project area, the proposed undertaking will contribute to the preservation and enhancement of the eroding bluffs located south of the harbor structures.

2.69 Although the historic, archaeological, and paleontological potential for this site is low, the Corps must give appropriate consideration to possible project impacts on the aforementioned values in the preparation of environmental impact statements. Accordingly, the Corps has forwarded a copy of the draft environmental impact statement (with this final EIS to follow upon release) to the following for their comment:

1. Dr. William Lovis (for) the Conference on Michigan Archaeology

2. Mr. Samual A. Milstein, Chief, Bureau of Recreation and State (Michigan) Historic Preservation Officer
3. Dr. James Fitting, State (Michigan) Archaeologist
4. Mr. Floyd Patterson, (Michigan) Historic Preservation Coordinator
5. Department of Interior for Investigations of Historical, Archaeological and Paleontological Resources
6. Advisory Council on Historic Preservation

EXISTING ECOLOGICAL SYSTEM OF THE BEACH, NEARSHORE ZONE AND LAKE

2.70 Regarding the ecological systems of the project area, flora and fauna in the specific project area are quite sparse. The littoral environment is subject to varying degrees of sand movement, currents, erosion, accretion and turbidity. Erosion of the beaches and clay bluffs results in a turbid lake condition as the silt and clay size fraction of the bluffs are carried into suspension in the littoral stream. The unstable bluff faces are steep and now nearly void of vegetation.

2.71 A variety of game fish populate Lake Huron (see Appendix C for summary of 1974 Sport Fishing Survey for Lake Huron and its Tributary Streams). Port Sanilac has a representative Great Lakes fishery including Salmon, Brown and Rainbow Trout, and Walleye, with some inshore Small Mouth Bass and Yellow Perch fishery. The Michigan Department of Natural Resources has planted fish off the beaches by Port Sanilac, Lakeport and Forestville in an effort to benefit the fishery of the entire area. A breakdown of the fish plants follow.

Rainbow Trout (Salmo gairdneri):

Year of Plant	Location	Number of Fish
1971	Port Sanilac	30,000
1971	Lakeport	30,000
1971	Forestville	20,000
1972	Port Sanilac	15,000
1972	Forestville	5,000
1973	Forestville	25,000
1973	Port Sanilac	35,000

Brown Trout (Salmo trutta):

1972	Lakeport	10,000

Coho Salmon (Salmonidae):

1970	Port Sanilac	25,000

2.72 However, the Coho Salmon are all gone because the initial plant generated no offspring due to lack of suitable local streams entering Lake Huron in the immediate vicinity of the plant.

2.73 Little information is available on Lake Huron fish populations as a whole with the exception of the commercial fishing records from Saginaw Bay where the fishing is primarily confined. Alewives and Smelt are now the dominant group in the lake. The aforementioned is one of several changes that have occurred in the general fish population since 1900. Before this time the catch consisted of lake trout, lake herring, yellow perch, walleye, whitefish, and suckers. By 1940 the yellow perch population had declined and carp had assumed commercial importance. In 1968 the catch consisted of carp (cyprimus carpo), yellow perch (Perca flavencens), chubs, whitefish, walleye, (Stizostedion v. vitreum) and suckers as the predominant species. The total production of fish dropped from 21.6 million pounds in 1900 to 5.1 million in 1968. The 1974 total all year commercial fishery obtained primarily from Saginaw Bay on Lake Huron was 1,531,065 pounds. (See Appendix C for summary breakdown by fish type.)

2.74 The sea lamprey which had become established earlier here than in the upper two lakes, seems to have been responsible for the decline of the lake trout population which occurred after 1940. The decline of the whitefish on the other hand seems to have been due to the use of deep water trapnets and heavy fishing, which had affected the population sufficiently that when the net depth was limited the fish numbers continued to decline. Predation by the sea lamprey is also considered to be one of the causes. In general, the changes in populations occurred first in Saginaw Bay and may be attributed to increasing pollution loads. The Sauger (Stizostedion canadense) has also declined to only a few hundred fish a year during the last few years. This particular decline started around 1935. Also of significance is the dramatic increase in the alewife population which has followed the same pattern as seen in Lake Michigan.

2.75 In general then, the changes above can be attributed to several factors: sea lamprey predation, overfishing, and other changes in the environment.

2.76 Few people have caught fish in the highly turbid waters immediately adjacent to the eroding bluffs. As has been reported with dredging operations that caused temporary turbidity and temporary migration of the fish life which may have been inhabiting those areas, highly turbid waters adjacent to the eroding bluffs may no longer contain the previous indigenous fish populations. In addition, few people are now offered any recreational use such as shore fishing in the high energy surf zone immediately underlying unstable eroding bluffs that have such a high potential for landslides. The proposed plan for mitigation of shore damage attributed to the Federal navigation structures at Port Sanilac Harbor, Michigan, will not effect or impact on threatened, rare and endangered species of fish and wildlife within the project site.

2.77 Regarding an analysis of the macroinvertebrates of Port Sanilac Harbor, please see Appendix A, subsection depicting the June 4-5, 1974, and March 4, 1975, sampling and subsequent analysis of that same harbor by the U. S. Environmental Protection Agency.

WATER QUALITY

2.78 In 1965 the Office of Water Programs, U.S.E.P.A., conducted deepwater surveys in Lake Huron involving 50 chemical and 40 microbiological stations. The surveys showed that the quality of water in the main body of Lake Huron is excellent. Lake Huron waters, as a whole, are low in turbidity, moderate in hardness, and, for the most part, very clear.

2.79 At the time of the referenced survey, water quality in a number of nearshore areas within harbors and the mouths of tributary streams was lower than that of Lake Huron Proper. Port Sanilac Harbor was one such impacted area. However, as indicated in paragraph 2.41, sewage overflow from Port Sanilac will no longer empty into the harbor, but will now discharge 0.8 miles south of the harbor. While this, in combination with control of craft discharges, should contribute to the continued increase in water quality in the harbor area; it may contribute to a decrease in water quality 0.8 miles south of the harbor and downdrift toward the project area. However, while overflow discharges often contain elevated concentrations of bacteria, biological oxygen demand substances, suspended solids, chlorides, and nutrients, the construction of a new lagoon sewer system in 1973 should significantly reduce the likelihood that such an adverse impact would occur.

2.80 As previously indicated, the littoral environment is subject to varying degrees of sand movement, currents, erosion, accretion and turbidity. Erosion of the beaches and clay bluffs result in a turbid lake condition as the silt and clay size fraction of the bluffs are carried into suspension in the littoral stream.

2.81 The Water Quality Control Information System (STORET) has been consulted for existing water quality parameter data taken for the proposed mitigation project area located south of Port Sanilac Harbor. One station on STORET was located in the area of the proposed project. Water quality was found to be excellent. A Table of parameters analyzed is found on page 45c. As indicated in paragraph 1.24, water quality will be monitored to insure that no degradation occurs in the vicinity of the harbor as a result of the proposed mitigation plan. In-as-much as the community of Port Sanilac obtains its municipal water supply from existing wells and not from Lake Huron, no contamination of that water supply is anticipated as a result of the proposed mitigation plan.

AIR QUALITY

2.82 Referencing air quality, the Port Sanilac area can be described as non-industrial to rural. Port Sanilac and Sanilac County lie within EPA's Central Michigan Intrastate Air Quality Region. This region consists of 29 counties comprising some of Michigan's greatest industiral concentrations. This explains the following Priority Category levels given for the region as a whole.

Particulates - Priority II
Sulphur Oxides - Priority III
Carbon Monoxide - Priority III
Nitrogen Oxides - Priority I
Photo-Chemical Oxidants - Priority III

Each priority has certain concentration limits which define the classification system for each pollutant. Referencing the levels of pollution, in layman's terms, Priority I indicates the highest level of pollution relative to Priority II, indicating intermediate levels of pollution, and Priority III, indicating lowest levels of pollution.

Grosse Ile Laboratory (Agency Code - 1156030)   Station No. - 4320[illegible]
Sta. Latitude - [illegible]   Secondary Sta. [illegible]
Sta. Longitude - [illegible]
3/4 mile [illegible] of [illegible]
Water Depth at Station - 30.9 Feet

Storet Number	Parameter	Method	Units	No.	Mean	Variance	Std. Dev.	Max	Min	Beginning Date	Ending Date
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	65/[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	65/[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	65/[illegible]	[illegible]
0[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	65/[illegible]	[illegible]
0[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	65/04/2[illegible]	[illegible]
0[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0[illegible]	RESIDUE	TOTAL	MG/L	5	122.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	65/[illegible]	65/[illegible]
0[illegible]	RESIDUE	DISS-105	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	65/04/21	65/[illegible]
0[illegible]	RESIDUE	TOT NFLT	[illegible]	5	4.[illegible]	[illegible]	[illegible]	[illegible]	1.[illegible]	65/04/2[illegible]	65/[illegible]
0[illegible]	RESIDUE	VOL NFLT	MG/L	5	2.[illegible]	3.2[illegible]	[illegible]	[illegible]	[illegible]	65/04/2[illegible]	65/[illegible]
0[illegible]	[illegible]	[illegible]	MG/L	6	.1[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]/11	65/[illegible]
0[illegible]	NH3-N	TOTAL	MG/L	6	.2[illegible]	.[illegible]	.124[illegible]	[illegible]	[illegible]	65/[illegible]/11	65/[illegible]/03
0[illegible]	NO2-N	TOTAL	MG/L	9	.0[illegible]	.0[illegible]	.[illegible]	[illegible]	.0[illegible]	65/[illegible]/03	65/[illegible]
00[illegible]	NO3-N	TOTAL	MG/L	12	.3265[illegible]	.[illegible]	.4[illegible]	1.[illegible]	.[illegible]	65/05/[illegible]	65/11/03
00[illegible]	[illegible]	[illegible]	MG/L	12	.1[illegible]	.0[illegible]	.154[illegible]4	.[illegible]	.0[illegible]	65/[illegible]/03	65/11/03
00[illegible]	[illegible]-1	[illegible]	MG/L	7	.[illegible]714	.0[illegible]	.[illegible]7017	.1[illegible]	.0[illegible]	65/[illegible]/11	65/11/03
00720	CYANIDE	CN-TOT	MG/L	1	.01[illegible]			.01[illegible]	.01[illegible]	65/04/21	65/04/21
00900	TOT HARD	CACO3	MG/L	5	100.40[illegible]	44.3[illegible]76	6.693[illegible]	11[illegible]	9[illegible]	65/04/21	65/11/03
00915	CALCIUM	CA,DISS	MG/L	5	26.2[illegible]	6.2[illegible]26	2.49[illegible]3	30.0[illegible]	23.0[illegible]	65/04/21	65/11/03
00925	MGNSIUM	MG,DISS	MG/L	5	8.20[illegible]	[illegible]	2.[illegible]	1[illegible]	[illegible]	65/04/21	65/11/03
00930	SODIUM	NA,DISS	MG/L	4	3.25[illegible]	2.25[illegible]	1.50[illegible]	4.[illegible]	1.[illegible]	65/04/21	65/11/03
00935	PTSSIUM	K,DISS	MG/L	4	1.[illegible]	.0[illegible]	.[illegible]	1.[illegible]	1.00[illegible]	65/04/21	65/11/03
00940	CHLORIDE	CL	MG/L	5	6.2[illegible]	1.2[illegible]	1.[illegible]46	[illegible]	5.00[illegible]	65/04/21	65/11/03
00945	SULFATE	SO4-TOT	MG/L	5	16.4[illegible]	2[illegible].3[illegible]	4.[illegible]	2[illegible]	9.[illegible]	65/04/21	65/[illegible]/03
00955	SILICA	DISOLVED	MG/L	5	1.44[illegible]	.27[illegible]	.[illegible]24[illegible]	2.[illegible]	1.[illegible]	65/04/21	65/11/03
01045	IRON	FE,TOT	UG/L	5	32[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	65/04/21	65/11/03
31501	TOT COLI	MFIMENDO	/100ML	5	1.[illegible]	.[illegible]	.[illegible]44[illegible]	[illegible]	1.[illegible]	65/04/21	65/11/03
31616	FEC COLI	MFM-FCBR	/100ML	2	2.00000	.0[illegible]	.[illegible]	2.[illegible]	2.[illegible]	65/04/21	65/05/19
31679	FECSTREP	MF M-ENT	/100ML	2	2.00000	.000000	.00[illegible]	2.0[illegible]	2.0[illegible]	65/04/21	65/05/19
01749	TETOCONT	TRO20045	PER ML	4	45.2500	784.250	27.8451	7[illegible]	1[illegible]	65/05/19	65/11/03
01751	TETOCONT	TRO35024	PER ML	5	51.6000	[illegible]	[illegible]	[illegible]	[illegible]	65/04/21	65/11/03
01754	INVALID			4	45.2500	784.25[illegible]	27.8[illegible]	7[illegible]	1[illegible]	65/05/19	65/11/03
32730	PHENOLS	TOTAL	UG/L	5	2.80[illegible]	9.[illegible]	3.111[illegible]	[illegible]	[illegible]	65/04/21	65/11/03

STORET DATE 75/11/25

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3. RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS

EXISTING USE OF THE SHORE AREA

3.01 Water areas have special appeal to man. A growing population and an affluent society have placed increased emphasis on water-based activities and lakeside living. Much of the relaxation and environmental surroundings so needed for today's high-tempo living is furnished by such areas as the Lake Huron shoreline. However, quite often these shorelines are subject to severe erosion caused from wind and wave action, violent storms, high water levels and normal erosion processes, as well as from beneficially intended protective structures or man-made changes. Human misery and damage to property often result from these processes. Shore erosion and structural damage are present to a degree at Port Sanilac, Michigan, and vicinity. In this regard, an investigation was requested by the State of Michigan's Department of Natural Resources, Dr. Ralph A. MacMullan, Director. Dr. MacMullan's letter of 11 September 1970, copy included in supplement Appendix C, requested a study concerning the problem of deposition of littoral materials on the northerly side of Port Sanilac Harbor, Michigan, and a determination of whether the Government breakwaters are responsible for the beach erosion damages to the south of the installation. Such a study is provided for under the authority of Section 111 of the River and Harbor Act of 1968 (P.L. 90-483, approved 13 August 1968) as follows:

> "The Secretary of the Army, acting through the Chief of Engineers, is authorized to investigate, study, and construct projects for the prevention or mitigation of shore damages attributable to Federal navigation works. The cost of installing, operating and maintaining such projects shall be borne entirely by the United States. No such projects shall be constructed without specific authorization by Congress if the estimated first cost exceeds $1,000,000."

3.02 The Corps of Engineers proposal to mitigate shore erosion in the vicinity of Port Sanilac Harbor, Sanilac County, Michigan, that is attributable to the Federal navigation structures at that harbor conforms with the objectives and specific terms of existing or proposed Federal, State, and local land use plans, policies and controls for the area affected.

3.03 Local shoreland regulation and management techniques which might be applied include zoning, subdivision regulation, building codes, ordinances, permits, acquisition, taxes, condemnation, and evacuation. It should be noted that evacuation and moving of structures would not be warranted even if the cost thereof would be less than the cost of shore protection by other means. Evacuation is rarely acceptable to the interest concerned.

3.04 The State of Michigan Shoreland Management and Protection Act of 1970 states that:

> (a) Within three years after the effective date of the Act, all local units of government (cities, villages, counties, and townships) which are situated along the shores of the Great Lakes may zone those high risk erosion and environmental areas as determined from those studies described in (c) below. If local units of government fail to zone those areas within the three-year period, the Water Resources Commission is authorized to set regulations for the zoning of these properties.
>
> (b) Within 18 months after the effective date of the Act, the Water Resources Commission is required to prepare a comprehensive plan for the overall management of Michigan's Great Lakes shorelands. It is expected that recommendations emanating therefrom will guide future shoreland use and development.
>
> (c) Within one year after the effective date of the Act, the Michigan Water Resources Commission shall make an engineering study on the shorelands to determine the high-risk erosion areas and to develop alternatives for the best means to prevent such erosion. Similarly, the Department of Natural Resources will make an environmental study of the shorelands to locate those valuable natural and fish and wildlife habitat areas which should be protected from further encroachment or damage.

The zoning regulations for the Village of Port Sanilac do not contain rules for the development of high-risk erosion areas. The State of Michigan, under the Shoreland Protection and Management Act, has no control over shoreland already platted and developed, and its effect would not eliminate unwise development in those areas subject to erosion. The act would, however regulate a mandatory building set-back distance on any undeveloped property that remains.

PRIOR REPORTS

3.05 In accordance with provisions of Section 5, River and Harbor Act of August 30, 1935 (Public Law 409, 74th Congress), and supplemental War Department regulations, a report on the probable effect of a navigation structure on the shoreline was prepared by the Shore Protection Board, Office of Chief of Engineers, and forwarded to the Division Engineer, Great Lakes Division, 23 September 1936. In order to determine the nature and extent of the probable effects of the proposed harbor improvement at Port Sanilac, a study was made of the conditions and changes that have taken place at Harbor Beach, 32 miles to the north, since its construction in 1885. The Harbor Beach harbor configuration was very similar to the one proposed at Port Sanilac; therefore, it was believed that the resulting effects could be similar at the two localities. In addition, studies of shoreline changes, hydrographic surveys, current measurement, and analyses of beach material were conducted in the Port Sanilac area. Surveys were conducted in 1858 and 1913 by the U. S. Lake Survey. The shoreline changes were small and irregular with recession slightly predominating. However, the small scale used did not lend itself to accurate representation. The largest area of accretion began approximately two miles above the harbor improvement and extends approximately one half mile to its south. The accretion averaged 20 feet along the 2.6 miles of shoreline above and below Port Sanilac. Over the 55 year period of record this is an average of approximately 0.4 feet per year. The small scale of the map utilized in the aforementioned 23 September 1936 report, and the small amount for annual progression may not be representative and is inconclusive due to the apparent lack of adjustment for lake levels. On the basis of this harbor comparison and analyses of field data it was the opinion of the Shore Protection Board that the improvements at Port Sanilac would cause some silting and marsh formation along the shoreline north of the harbor and within the enclosure of the breakwater. To date a substantial amount of sand has been deposited.

3.06 A report to assess the nature and extent of erosion and the need for protection of the shoreline zone of the United States portion of the Great Lakes entitled Great Lakes Region Inventory Report - National Shoreline Study was published in August 1971.

3.07 A Preliminary Examination Report on Property Damages on the Great Lakes was prepared in June 1952. A joint study is presently being accomplished by the International Joint Commission of Canada and the United States with assistance of various Government agencies and departments. The purpose of this study, among other things, is to investigate the feasibility of further regulation of the Great Lakes water levels to reduce property damage of unprotected shore reaches. Data collected for the 1952 Preliminary Examination Report is being incorporated into the current study.

3.08 A Great Lakes Basin Framework Study Report is being coordinated

by the Great Lakes Basin Commission and will serve as the foundation for a comprehensive, coordinated, joint plan for development of water and related resources. Appendix 12, Shore Use and Erosion, of the report analyzes the nature and extent of shoreline erosion and flooding damages, and presents data on shoreline use and development alternatives. The Framework Study appendix was prepared concurrently with the Great Lakes Region Inventory Report. On 7 December 1973 The International Great Lakes Level Board released the report titled "Regulation of Great Lakes Water Levels."

BENEFITS TO SHORE PROPERTY

3.09 Erosion along the shores of Lake Huron is a natural occurrence. This natural shore erosion is a matter of record for hundreds of years, both north and south of Port Sanilac, Michigan. The effects of this natural erosion is continuous. This natural continuous process is often overlooked. The Corps of Engineers has limited its erosion problem solution to only the Federal project impact on the natural occurrence. The solution suggested will, as a minimum, re-establish the long-term natural rate of shore erosion.

RULES AND REGULATIONS

PERMITS FOR ACTIVITIES IN NAVIGABLE WATERS

3.10 Referencing the construction of shore protection structures and other activities, the following applicable rules and regulations governing permits for activities in navigable waters are included for clarity.

3.11 Section 404 of the Federal Water Pollution Control Act (PL 92-500, 86 Stat. 816, 33 U.S.C. 1344) authorizes the Secretary of the Army, acting through the Chief of Engineers, to issue permits, after notice and opportunity for public hearings, for the discharge of dredged or fill material into the navigable waters at specified disposal sites. The selection of disposal sites will be in accordance with guidelines developed by the Administrator of the Environmental Protection Agency (EPA) in conjunction with the Secretary of the Army. Furthermore, the Administrator can prohibit or restrict the use of any defined area as a disposal site whenever he determines, after notice and opportunity for public hearings, that the discharge of such materials into such areas will have an unacceptable adverse effect on municipal water supplies, shell fish beds and fishery areas, wildlife, or recreational areas.

3.12 Section 10 of the River and Harbor Act approved March 3, 1899 (30 Stat. 1151; 33 U.S.C. 403), prohibits the unauthorized obstruction or alteration of any navigable water of the United States. The construction of any structure in or over any navigable water of the United States, the excavation from or depositing of material in such waters, or the accom-

plishment of any other work affecting the course, location, condition, or capacity of such waters are unlawful unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of the Army. The instrument of authorization is designated a permit or letter of permission.

GENERAL POLICIES FOR EVALUATING PERMIT APPLICATIONS

3.13 (1) The decision whether to issue a permit will be based on an evaluation of the probable impact of the proposed structure or work and its intended use on the public interest. Evaluation of the probable impact which the proposed structure or work may have on the public interest requires a careful weighing of all those factors which become relevant in each particular case. The benefit which reasonably may be expected to accrue from the proposal must be balanced against its reasonably foreseeable detriments. The decision whether to authorize a proposal, and if so, the conditions under which it will be allowed to occur, are therefore determined by the outcome of the general balancing process (e.g., see Sec. 209.400, "Guidelines for Assessment of Economic, Social and Environmental Effects of Civil Works Projects"). That decision should reflect the national concern for both protection and utilization of important resources. All factors which may be relevant to the proposal must be considered; among those are conservation, economics, aesthetics, general environmental concerns, historic values, fish and wildlife values, flood damage prevention, land use classifications, navigation, recreation, water supply, water quality and, in general, the needs and welfare of the people. No permit will be granted unless its issuance is found to be in the public interest.

3.14 The Water Resources Planning Act (42 U.S.C. 1962 et seq.) provides for the possible establishment, upon request, of the Water Resources Council or a State of river basin water and related land resources commissions. Each such commission shall coordinate Federal, State, interstate, local and nongovernmental plans for the development of water and related land resources in its area, river basin, or group of river basins. In the event the proposed Corps of Engineers permits to non-governmental developers or other agencies under Section 10 of the River and Harbor Act of 1899 and Section 404 of the Federal Water Pollution Control Act may affect the plans of such river basin commissions, the permits will be coordinated with the appropriate concerned river basin commissions. The same is true of Corps of Engineers authorizations to private persons or corporations to improve navigable rivers at their own expense under Section 1 of the River and Harbor Act of 1902.

3.15 Definitions. For the purpose of issuing or denying authorizations under this regulation:

a. The term "navigable waters of the United States" and "navigable waters," as used herein mean those waters of the United States which are subject to the ebb and flow of the tide, and/or are presently, or have been in the past, or may be in the future susceptible for use for purposes of interstate or foreign commerce (See 33 CFR 209.260 for a more complete definition of these terms).

b. The term "ocean waters," as defined in the Marine Protection Research and Sanctuaries Act of 1972 (PL 92-532, 86 Stat. 1052), means those waters of the open seas lying seaward of the base line from which the territorial sea is measured, as provided for in the Convention on the Territorial Sea and the Contiguous Zone (15 UST 1606; TIAS 5639).

c. The term "dredged material" means any material excavated or dredged from navigable waters of the United States including any runoff or overflow which occurs during a dredging operation or from a contained land or water disposal area.

d. The term "fill material" means any material deposited or discharged into navigable waters which may result in creating fastlands or other planned elevations of lands beneath navigable waters.

e. The term "person" means any individual, corporation, partnership, association, State, municipality, commission, or political subdivision of a State, any interstate body, or any agency or instrumentality of the Federal Government.

f. The term "coastal zone" means the coastal waters and adjacent shorelands designated by a State as being included in its approved coastal zone management program under the Coastal Zone Management Act of 1972.

4. THE ENVIRONMENTAL IMPACT OF THE PROPOSED ACTION

4.01 There are some very important intangible and tangible environmental benefits which would result from implementing the recommendations of the Section 111 Detailed Project Report on Shore Damage at Port Sanilac, Michigan, by development of an initial feeder beach and subsequent periodic nourishment to mitigate the shore damage attributed to the navigation structure. The most significant intangible benefits to accrue from the mitigation plan are the reduction of the hazard of possible human injury and reduction of insecurity and mental anguish among residents regarding property and other losses. Restoring the littoral drift would provide the sand needed to begin natural development of beaches and provide environmental enhancement. The considered mitigation plan would replenish the altered littoral environment, safeguard valuable property, improve the long-range turbid condition of the lake near shore, reduce the bank erosion which is now aesthetically displeasing and threatening valuable property, decrease the costs of maintaining existing shore protective

structures, eliminate the need for installing new structures, improve fish and wildlife habitat and provide additional beach areas. The resulting beaches would be aesthetically pleasing as well as providing recreational bathing and surf fishing beaches.

4.02 Creation by artificial means of an initial feeder beach and subsequent nourishment supplied to the areas suffering shore damage has been selected as the most practicable plan for mitigating the effects of the navigation structures. A plan has been developed for the Port Sanilac area. Provision of a feeder beach with subsequent nourishment supplied artificially at the normal littoral transport rate to the feeder beach will lessen the erosion of the shores downdrift. The provision of an initial feeder beach and subsequent nourishment would mitigate bluff erosion due to the navigation project until that same nourishment has established a simulated natural pattern of littoral drift.

4.03 Creating a beach would approach a natural condition that might exist were it not for the navigation structures. The initial feeder beach and subsequent nourishment would dissipate by natural processes. As borrow material moved lakeward in the littoral zone, sandbars would begin to develop. Once these sandbars form after a period of annual nourishment, beaches would develop and wave energy would dissipate on the bars and beaches, rather than on the toe of the now eroding bluffs and existing shore protection structures.

4.04 It is considered that a plan of artificial beach nourishment would establish the shoreline and fill private shore protective structures to conditions generally existing prior to construction of the navigation project. Existing shore protection structures extend for 4,400 feet south of the harbor. Wide armored beaches extend from 4,400 feet south to 8,200 feet south of the harbor. Bluff and beach erosion in this area is minimal. The area of severest erosion extends from 8,200 feet south to 13,700 feet south of the harbor (Camp Ozanam). The proposed mitigation plan would provide for initial placement of a feeder beach approximately 150 feet wide, extending 3,000 feet from 7,400 feet south to 10,400 feet south of the harbor. The initial feeder beach would contain approximately 30,000 cubic yards of unpolluted sand fill obtained from nearby commercial pits. Subsequent (approximately) annual nourishment would provide 30,000 cubic yards of unpolluted sand along a 2,000 foot long stretch of shoreline between 7,400 feet and 9,400 feet south of the harbor. The periodic nourishment fill would extend out about 100 feet. A roadside park is located between 8,900 feet and 10,400 feet south of the harbor. The unpolluted sand fill would be obtained from land borrow areas. The proposed land borrow areas are all commercial pits. Local commercial pits were investigated. The exact pit site or sites for supply will not be decided upon until Plans and Specifications Stage. The source material obtained from land borrow areas could be transported by truck along Highway 25 to Washington Road; then placed over the bluff by a temporary hopper conveyor system where it would then be spread into place by earth moving equipment. After placement the

material would be acted upon by natural currents. Periodic nourishment would be equal to the amount of material interrupted by the harbor.

4.35 Utilization of the aforementioned plan would cause inconvenience to motorists using residential streets. Diesel fumes would irritate residents living along these streets as would the noise from the truck, earth moving equipment, and hopper-conveyor systems.

4.36 The appearance and environment of the site in the area of the mining operation of any given commercial pit, yet to be selected, would be altered to the effect of the initial removal of approximately 90,000 cubic yards and (if selected as a continuing source) the periodic removal of approximately 30,000 cubic yards of unpolluted sand. The shape and/or depth of any given selected pit would be altered by the removal of the aforementioned volumes of unpolluted sand meeting Corps gradation and environmental parameter acceptability requirements. An initial inspection of several existing individual pit sites revealed landscapes containing limited areas of sterile and eroding soils. This is not surprising in view of the fact that the State of Michigan has no control over unconsolidated pits (sand and gravel open pit mining). This is further evidenced by the specific exclusion of such operations from Michigan's recently enacted and implemented Sedimentation and Erosion Control Act. Further, Sanilac County and the Townships located therein have not enacted any Mineral Mining Control Ordinances. In view of the aforementioned, it is anticipated that the removal of an initial 90,000 cubic yards and subsequent periodic removal of 30,000 cubic yards of sand will not alter the existing environment of any existing commercial pit site to any significant degree. Of the potential sites inspected, all surface drainage was to the interior of the excavated basins. Therefore, while it would be difficult to predict with accuracy the amounts of soils that would be eroded during an intense rainfall over areas disturbed by mining activity, it would be reasonable to expect such eroded materials to be retained within those pits inspected and thereby not enter the downstream environments.

4.37 The method of operation and type of machinery utilized can vary from front end loader and dump trucks to dragline, screening plant, rubber tired or tracked earth movers and/or clam shell or bucket cranes. Trucks, if overfilled, would have a tendency to spill transported materials onto the haul roads and these spilled materials would be churned by repeated truck traffic. Wind will cause some degree of wind erosion from excavated and stockpiled areas. However the aforementioned potential to create dust would be ameliorated as indicated previously in Section 1, Project Description, under the subsection addressing Dust Control.

4.38 Beach formation will temporarily put sediments into suspension. This will increase turbidity only temporarily because the sand should settle out rapidly. The effect of the project in artificially stabilizing the beaches should be to decrease the turbidity in the area which is now a

result of the present shore erosion. Since the material to be placed is unpolluted sand, it is not expected that any toxic pollutants will be released in the area as a result of the project. A temporary depression in the dissolved oxygen content of the water will occur in the immediate area of the beach formation. This temporary depressing will be due to the inevitable resuspension of small amounts of organic or oxygen demanding material. Nektonic species and oxygen dependent motile organisms will tend to avoid the area until these conditions subside, and normal dissolved oxygen levels are restored.

4.09 Due to continuing sheet wash, ground water seepage, mass wasting, undermining of bluff toes due to high water, and subsequent landslides, the unstable bluffs are steep and nearly void of vegetation. The deprivation of vegetative feed and natural protective cover has caused the displacement of the indigenous fauna to similar adjacent unaffected environments.

4.10 The proposed plan for mitigation of shore damage attributed to the Federal navigation structures at Port Sanilac Harbor, Michigan, will not effect or impact on the threatened, rare and endangered species of fish and wildlife within the project site.

4.11 It is expected that the beach formation will cause a temporary inconvenience to the local residents, boaters and other users of the area. This temporary inconvenience should not cause any undue hardship on the residents of the area.

4.12 Water quality will be monitored to insure that no degradation occurs in the vicinity of Port Sanilac Harbor. The Corps will coordinate its proposed action with the local community. The Sanilac County Health Department will be asked to monitor the quality of the water to insure that no degradation occurs in the vicinity of Port Sanilac Harbor. If any variation in acceptable standards are noted during monitoring operations, the village or county will notify the U. S. Army Corps of Engineers, Detroit District, Saginaw area office, and/or the U. S. Coast Guard and/or the Corps Detroit District Office; at which time the Corps mitigation activities will be immediately stopped until corrective action satisfactory to all parties concerned can be initiated.

4.13 Beach nourishment will not alleviate erosion of the bluff due to ground water seepage or sheet erosion and other natural processes. The placement and nourishment of the feeder beach may eventually increase the littoral drift supply to the south, but the rate of erosion in these areas would still be expected to continue due to natural causes.

5. ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED SHOULD THE PROPOSAL BE IMPLEMENTED

5.01 The negative impacts of the proposal are few.

5.02 The appearance and environment of the site in the area of the mining operation of any given commercial pit, yet to be selected, would be altered to the effect of the initial removal of approximately 90,000 cubic yards and (if selected as a continuing source) the periodic removal of approximately 30,000 cubic yards of unpolluted sand. The shape and/or depth of any given selected pit would be altered by the removal of the aforementioned volumes of unpolluted sand meeting Corps gradation and environmental parameter acceptability requirements. An initial inspection of several existing individual pit sites revealed landscapes containing limited areas of sterile and eroding soils. This is not surprising in view of the fact that the State of Michigan has no control over unconsolidated pits (sand and gravel open pit mining). This is further evidenced by the specific exclusion of mining operations for Michigan's recently enacted and implemented Sedimentation and Erosion Control Act. Further, Sanilac County and the Townships located therein have not enacted any Mineral Mining Control Ordinances. In view of the aforementioned, it is anticipated that the removal of an initial 90,000 cubic yards and subsequent removal of 30,000 cubic yards of sand will not alter the existing environment to any significant degree. Of the potential sites inspected, all surface drainage was to the interior of the excavated basins. Therefore, while it would be difficult to predict with accuracy the amounts of soils that would be eroded during an intense rainfall over areas disturbed by mining activity, it would be reasonable to expect such eroded materials to be retained within those pits inspected and thereby not enter any downstream environments.

5.03 The method of operation and type of machinery utilized can very from front end loader and dump trucks to dragline, screening plant, rubber tired or tracked earth movers and/or clam shell or bucket cranes. Trucks, if overfilled, would have a tendency to spill transported materials onto the haul roads and these spilled materials would be churned by repeated truck traffic. Wind will cause some degree of wind erosion from excavated and stockpiled areas. However, the aforementioned potential to create dust would be ameliorated as indicated previously in Section 1, Project Description, under the subsection addressing Dust Control.

5.04 Implementation of the proposed plan utilizing highway trucks to haul unpolluted sand fill from commercial pits would cause inconvenience to motorists using residential streets. Diesel fumes would irritate residents living along these streets as would the noise from the truck, earth moving equipment, and hopper-conveyor systems. Regardless of the routes utilized, it should be noted that the possible heavy truck traffic may necessitate increased maintenance on the roads to be used.

5.05 Beach formation will temporarily put sediments into suspension. This will increase turbidity only temporarily because the sand should settle out rapidly. The effect of the project in artificially stabilizing the beaches should be to decrease the turbidity in the area which is now a result of the present shore erosion. Since the material to be deposited is unpolluted sand, it is not expected that any toxic pollutants will be released in the area as a result of the project.

5.06 Water quality in the nourishment area would temporarily be affected in an adverse manner. As previously indicated, turbidity normally associated with nourishment operations would occur. Noticeable turbidity would be of short duration. However, a temporary depression in the dissolved oxygen content of the water will occur in the immediate area of the beach building operations. This temporary depression will be due to the inevitable resuspension of small amounts of organic or oxygen demanding material. Nektonic species and oxygen dependent motile organisms will tend to avoid the area until these conditions subside, and normal dissolved oxygen levels are restored. Bottom-dwelling organisms in the immediate area of the proposed beach building location will be adversely affected. This effect, however, should be minimal because few bottom-dwelling organisms normally exist in the wave-washed shore area.

5.07 Due to continuing sheet wash, ground water seepage, mass wasting, undermining of bluff toes due to high water, and subsequent landslides, the unstable bluffs are steep and nearly void of vegetation. The deprivation of vegetative feed and natural protective cover has caused the displacement of the indigenous fauna to similar adjacent unaffected environments.

5.08 It is anticipated that during temporary construction operations [an initial period not to exceed 90 days and periodic (approximately annual) replenishment periods not to exceed 50 days] the aesthetics of the affected shoreline would be degraded.

5.09 It is expected that the beach formation will cause a temporary inconvenience to the local residents, boaters and other users of the area. This temporary inconvenience should not cause any undue hardship on the residents of the area.

6. ALTERNATIVES TO THE PROPOSED ACTION

6.01 Ten alternative solutions to the proposed mitigation plan to mitigate shore damage and their respective effects on national economic development, environmental quality, social well-being, and regional development have been considered. Refer to Appendix B for summary of alternatives.

6.02 The primary objective of developing a Section 111 Project at Port Sanilac is to restore that part of the littoral drift which is being interrupted by the navigation project. The authority is not intended to provide mitigation measures of such magnitude as to approach the extent of protection usually associated with the development of regular beach erosion control projects. Since no single measure produces the same result and the effects are not susceptible to monetary evaluation, dollar values are not included as measures of gains or losses in the areas of national economic and regional development. The Section 111 authority states that the government will mitigate damages attributable to Federal navigation works when equitable and in the public interest, fully considering the preproject condition and intangible benefits. As a result, benefit-cost ratios for each alternative have not been developed to justify the project because of the difficulty in evaluating the preproject condition and intangibles.

6.03 It is obvious that a "Do Nothing" scheme, alternative 1, would not satisfy Section 111 of P.L. 90-483 since it has been established that a portion of the shore damage is attributable to the Federal navigation project. Predominant littoral drift is from north to south. Erosion rates are greater south of the harbor than north. It has not been established what the effect of the existing beneficially intended shore protection structures, located south of the harbor structures, have on downdrift erosion within the shore damage area and whether or not effects of the harbor are directly transferred downdrift by these structures. The existing conditions at Port Sanilac do not provide a suitable habitat for animal life which normally exist under stable bluff conditions with a suitable vegetative cover. This unstable condition of the bluff, resulting turbidity, and the natural lack of plant and animal life in the littoral zone indicate that a "Do Nothing" alternative would be detrimental to the environment along the shore damage area.

6.04 Alternative 2, removing the navigation structures at Port Sanilac, would eliminate recreational boat traffic at that harbor. This would result in a loss to the local economy. In addition, littoral drift would resume southward thus affecting the littoral accretion zone north of the harbor containing prime recreational beaches and shore developments.

6.05 Shoreland regulation and management techniques, alternative 3, which might be applied include zoning, subdivision regulation, building codes, ordinances, permits, acquisition, taxes, condemnation, and evacuation. The State of Michigan Shorelands Management and Protection Act of 1970 states that:

a. Within three years after the effective date of the Act, all local units of government (cities, villages, counties, and townships) which are situated along the shores of the Great Lakes may zone those high risk

erosion and environmental areas as determined from those studies described in (c) below. If local units of government fail to zone those areas within the three-year period, the Water Resources Commission is authorized to set regulations for the zoning of these properties.

b. Within 18 months after the effective date of the Act, the Water Resources Commission is required to prepare a comprehensive plan for the overall management of Michigan's Great Lakes shorelands. It is expected that recommendations emanating therefrom will guide future shoreland use and development.

c. Within one year after the effective date of the Act, the Michigan Water Resources Commission shall make an engineering study on the shorelands to determine the high-risk erosion areas and to develop alternatives for the best means to prevent such erosion. Similarly, the Department of Natural Resources will make an environmental study of the shorelands to locate those valuable natural and fish and wildlife habitat areas which should be protected from further encroachment or damage.

6.06 The zoning regulations for the Village of Port Sanilac do not contain rules for development of high risk erosion areas.

6.07 The State of Michigan, under the Shoreland Protection and Management Act, has no control over shorelands already platted and developed, and its effect would not eliminate unwise development in those areas subject to erosion. The act would, however, regulate a mandatory building set-back distance on any undeveloped property that remains.

6.08 Evacuation and moving of structures would not be warranted even if the cost thereof would be less than the cost of shore protection by other means. Evacuation is rarely acceptable to the interests concerned; if it were, it is likely that the evacuated area would require later direct protection and/or additional evacuation, as the originally evacuated area was eroded and lost.

6.09 Alternative 4 consists of partial removal of navigation structures, reduction of project depth, and shoreline management. Even partial removal of the piers and slight reduction of project depth would seriously restrict or eliminate recreational traffic.

6.10 Continuous armor protection with reshaping of the shoreline to a stable angle, alternative 5, would prevent all future damage which might be caused by the navigation structures and that due to natural processes of erosion. The turbid lake condition at the toe of the now seriously eroding bluffs would be eliminated. Seawalls have a tendency to cause scour along their bases. This deepening of the lake bottom would result in a loss of bathing beaches and recreational potential of the waterfront would decrease. Reshaping of the bluff would result in loss of real estate

and no doubt necessitate moving or razing of structures. A continuous belt of armor protection would deprive the littoral stream of its natural input from bluff erosion so the erosion problem would move downdrift and necessitate additional seawalls. Shore protection is generally aesthetically displeasing. As stated above, the Section 111 authority is not intended to provide mitigation measures of such magnitude as to approach the extent of protection usually associated with the development of regular beach erosion control projects. Therefore, continuous armor protection, alternative 5, as well as the structural alternatives which follow would be beyond the scope of Section 111 projects.

6.11 Alternative 6, groins, installed along the shoreline damage area would be an ineffective means of mitigating shore damage because littoral drift south of the harbor is insufficient to fill the groins. Physical loss of land would continue, resulting in a continued unstable littoral environment and a turbid lake condition. Interruption of the existing littoral drift would cause the erosion problem to move downdrift so that eventually a continuous belt of armor protection would be required. Structural property damage would continue with resulting continued economic decline.

6.12 Alternative 7, groins artificially filled upon initial construction, would prevent shore damage. Annual nourishment would maintain them in a filled condition. Borrow material for initial construction and annual nourishment would be taken from a land borrow area. Utilization of a land borrow area would allow for creation of a temporary turbid condition in the area of placement. Structural property damage would cease. Artificially created beaches within the groin field would serve as recreation bathing beaches. The Section 111 authority provides only for mitigation of erosion in excess of the natural rate. The authority is not intended to provide mitigation measures of such magnitude as to approach the extent of protection usually associated with the development of regular beach erosion projects. Alternative 8 falls within the latter category and therefore its implementation is not recommended.

6.13 Alternative 8, offshore breakwaters, would dissipate wave energy prior to its incidence upon the beach. Erosion would continue until the area between the breakwaters and the water's edge built up to a stable bottom profile and a protective beach formed. Eventual prevention of damages would result. Physical loss of land would eventually be eliminated and the turbid condition of the lake would eventually diminish. In addition, the offshore breakwaters could potentially act as fish attractors. However, offshore structures placed parallel to the shoreline would be aesthetically displeasing and a hazard to small craft navigation. Offshore structures would further alter the character of the littoral zone. Section 111 attempts to restore the natural character of the littoral zone by restoring the littoral drift interrupted by the navigation project.

6.14 Alternative 9, offshore breakwaters and annual beach nourishment, would accomplish all of that stated for alternative 10, but more rapidly. Nourishment would establish a stable bottom profile and a protective beach sooner than if the beach were developed from bluff erosion materials. Alternatives 8 and 9 were not recommended for the proposed mitigation plan for the same reason given for not recommending alternative 7.

6.15 Alternative 10: Protective Beaches. This alternative is similar to the proposed action except that efforts are usually made to retain the beach fill material in its originally placed location utilizing some form or means of confinement. As with the proposed action, this alternative would serve to eliminate erosion in the protected area. However, its confinement would prevent further downdrift transport. Wave action would sort, adjust slopes, and distribute the fill material. The initial overall slope of beach would become unavoidably steeper than that of the natural shore area. Eventually, offshore losses of sediment would occur. Hence, periodic nourishment would be required to maintain stability. This alternative was ruled out because it would not satisfy Section 111 in damage areas downdrift of any protective beach.

6.16 The primary objective of developing a Section 111 Project at Port Sanilac Harbor, Michigan, would be to restore that part of the littoral drift which is being interrupted by the navigation project. As was discussed, Section 111 is not intended to provide mitigation measures of such magnitude as to approach the extent of protection usually associated with the development of regular beach erosion control projects. Therefore, alternative solutions 5-9 would be beyond the authority of Section 111. Although it would be desirable to provide a completely stable shore by restoring the affected section of shorefront to a condition generally existing prior to construction of the navigation project, this would be impractical and would be beyond the authority of Section 111. The effects of wind and wave action, violent storms, high water levels and normal erosion processes, as well as possible adverse effects of structures intended to be protective, including man-made changes or adjustment in the shorefront configuration, may be the more critical factors which contribute to the shoreline deterioration. These factors have been evaluated and given proper weight and consideration in the analysis.

6.17 The only plan which would satisfy Section 111 of P.L. 90-483 by mitigating those damages only attributable to the Federal navigation project would be that advocated in the Detailed Project Report for Port Sanilac Harbor, Michigan. From an ecological and environmental viewpoint, restoration of littoral drift and elimination of navigation project caused damages would have the least negative environmental impacts and the most positive impacts. The selected plan represents one which is equitable, justified, and provides for reasonable mitigation measures. The primary objective of developing a Section 111 project at Port Sanilac is to restore

that part of the littoral drift which is being interrupted by the navigation project. This can best be accomplished by the construction of an initial feeder beach subsequent nourishment at the shore damage area based on erosion rates.

7. RELATIONSHIP BETWEEN SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

7.01 Long-term productivity will be enhanced by the project. Residential areas, transportation systems and existing land will be protected. Stabilization of the shore area and reduction of the erosion will safeguard the bluffs from much future damage and will decrease the adverse effect of the erosional products entering the lake. Presently large trees and other vegetation are falling into the lake, personal properties and homes are being lost, other homes are being threatened, many residents are being caused much discomfort and financial loss, and property values are decreasing in affected shore areas. This present condition should be changed for the better as a result of the project. The proposed mitigation plan will utilize a short-term expenditure of money, manpower, and resources, including petroleum based fuels, but the long-term gains in preventing shore damage are great and a good use of the short-term expenditures.

8. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED

8.01 The irretrievable use of resources for the proposed action involve the loss of sand for beach replenishment from land borrow areas and the commitment of manpower, money, and other resources, including petroleum based fuels, for the project. The sand obtained from the land borrow areas as well as the relatively small amount of petroleum based fuels utilized in construction constitute an irreversible limited commitment of mineral resources. Likewise, the manpower, money, and use of machinery and other equipment resources for the project will be irretrievable.

9. COORDINATION AND COMMENT AND RESPONSE

COORDINATION WITH THE PUBLIC AND OTHER AGENCIES

PUBLIC PARTICIPATION

9.01 There have been no public meetings convened for the purpose of reviewing or discussing the proposals contained in the Section 111 Detailed

Project Report on Shore Damage for Port Sanilac Harbor, Michigan. However, a Public Workshop is being contemplated. The purpose of the workshop will be to provide information and clarification of policy concerning Section 111 studies, and to provide the public and all interested parties with an opportunity to express their viewpoints, ask questions and raise issues bearing on the erosion problem to the District Engineer, Detroit District. At the time of this writing, no determination has been made as to the selection of a date, time or location of the anticipated Public Workshop.

GOVERNMENT ASSISTANCE

9.02 The Michigan Department of Natural Resources was requested to provide information concerning ecological systems and fishing activities in the Port Sanilac Harbor area. Other pertinent information and data were also obtained from the U. S. Environmental Protection Agency and the Bureau of Sport Fisheries and Wildlife, U. S. Department of Interior. Copies of related correspondence are presented in Appendix C.

AGENCIES AND OFFICIALS

9.03 Copies of the Draft Environmental Impact Statement were sent to United States Senators and Representatives, the State Governor, concerned Federal and State agencies, and local governments, interested private organizations and concerned citizens. The Draft Statement was also mailed in response to all requests. Requesting agency or citizen addresses were noted and these interested parties will also receive a copy of this Final Environmental Statement. In total, over 192 copies of the Draft Environmental Statement were distributed on or after 23 May 1975.

9.04 The Draft and this Final Environmental Statement have been sent to the following agencies or officials for comment:

Advisory Council on Historic Preservation
Federal Power Commission
Great Lakes Basin Commission
Michigan Area Council of Governments
Michigan Department of Commerce
Michigan Department of Natural Resources
Michigan Department of Public Health
Michigan Department of State Highways
Michigan Historical Commission -
    Office of Planning Coordinator
Port Sanilac Harbor Commission
State of Michigan, State Archaeologist
State of Michigan, State Historic Preservation Coordinator
State of Michigan, State Historic Preservation Officer
Sanilac County Board of Supervisors
Sanilac County Health Commission
Sanilac County Planning Commission
Sanilac County Road Commission

U. S. Department of Agriculture -
Forest Service
Soil Conservation Service
U. S. Department of Commerce -
National Marine Fisheries Service
National Oceanic & Atmospheric Administration
U. S. Department of Health, Education & Welfare
U. S. Department of Housing & Urban Development
U. S. Department of the Interior -
Bureau of Outdoor Recreation
Bureau of Sport Fisheries and Wildlife
U. S. Geological Survey
U. S. Department of the Interior (National Park Service)
for Investigations of Historical, Archaeological and
Paleontological Resources
U. S. Department of Transportation -
Federal Highway Administration
U. S. Coast Guard
U. S. Environmental Protection Agency
Village of Port Sanilac
Water Resources Council

CITIZEN GROUPS

9.05 The Draft Environmental Impact Statement has been sent to the following groups for comment:

Assn. of Conservation Ecologists
Federation of Garden Clubs of Michigan
Isaac Walton League of America
Michigan United Conservation Clubs
National Audubon Society
National Resources Defense Council
National Wildlife Federation
Sierra Club - Midwest Representative

The aforementioned groups will receive a copy of this Final Environmental Impact Statement.

9.06 At this time, there are no known environmental conflicts raised by citizen or conservation groups concerning the proposed beach replenishment program as an aid to mitigate beach erosion.

9.07 Copies of all pertinent correspondence and comments received in response to the Port Sanilac Harbor Section 111 Draft Environmental Impact Statement appear in Appendices C and D, respectively.

COMMENTS AND RESPONSE

9.08 The following comment/response section addresses pertinent comments and suggestions submitted by interested agencies, councils and commissions. In total, 11 replies to the Draft Environmental Impact Statement were received.

FEDERAL AGENCIES

Federal Power Commission - Regional Office

1. Comment: We have reviewed the Draft Environmental Statement dated May 1975 for proposed mitigation of shore damage attributable to the Federal navigation structures at Port Sanilac Harbor, Michigan, furnished with a letter dated May 28, 1975 from Mr. P. McCallister, Chief, Engineering Division. Our comments are requested.

2. Comment: Comments of this office are made in accordance with the National Environmental Act of 1969 and the August 1, 1973 Guidelines of the Council on Environmental Quality. Our principal concern with developments affecting land and water resources is the possible effect of such developments on bulk and electric power facilities including potential hydroelectric developments and on natural gas pipeline facilities.

3. Comment: Since the above noted proposed project apparently would pose no major obstacle to the construction and operation of such facilities, we have no comments on the Draft EIS.

4. Comment: The foregoing statements are of this office and therefore do not necessarily represent the views of the Federal Power Commission itself.

5. Comment: Thank you for the opportunity to comment on the Draft Environmental Statement.

U. S. Department of Agriculture - Forest Service
Northeastern Area - Environmental Quality Evaluation

1. Comment: We have reviewed the Draft Environmental Statement on Mitigation of Shore Damage Attributed to the Federal Navigation Structures at Port Sanilac, Michigan.

2. Comment: Since the greater part of the activity described will occur in the harbor, we anticipate no major effect on forests or other vegetation.

3. Comment: Thank you for the opportunity to review and comment on the draft.

U. S. Department of Agriculture
Soil Conservation Service

1. Comment: The draft environmental impact statement for the proposed creation of an initial protective beach and subsequent feeder beach to be

located in the vicinity of Port Sanilac Harbor, Sanilac County, Michigan, was received by this office for review and comment.

2. Comment: We offer the following suggestion:

In Section 1.46, Post-Construction Clean-up or Obliteration, it is stated that temporary facilities will be obliterated and "the area will be restored to near natural conditions which will permit the growth of vegetation thereon." In other sections of the Draft Environmental Statement, it is implied that these areas will be planted to trees and other vegetation. However, this is not clearly stated. Therefore, we suggest Section 1.46 be expanded to state that "temporary facilities such as haul roads, work areas, structures, stockpiles of excess or waste materials, or other vestiges of construction will be obliterated and the areas restored to near natural conditions. These areas will be vegetated with trees and grasses as directed by the Contracting Officer as a part of the overall project.

Response: It was not intended to imply that the referenced areas will be vegetated with trees and grasses as directed by the Contracting Officer as part of the overall project. Rather, as indicated under Restoration of Landscape damage, paragraph 1.50, "Any trees or other landscape feature scarred or damaged by the Contractor's (if any) equipment or operations shall be restored to a condition satisfactory to the Contracting Officer. Restoration of scarred and damaged trees shall be performed in an approved manner by experienced workmen. Trees damaged beyond restoration shall be removed and disposed of. Trees that are removed because of damage shall be replaced at the Contractor's (if any) expense by nursery-grown trees of the same species or a species approved by the Contracting Officer. The size and quality of nursery-grown trees shall also be approved by the Contracting Officer." Also, please refer to paragraph 1.52 for further clarification where it is indicated that, "temporary facilities such as haul roads, work areas, structures, stockpiles of excess or waste materials, or other vestiges of construction will be obliterated and the areas restored to near natural conditions."

3. Comment: We appreciate the opportunity to review and comment on this proposed project.

U. S. Department of Transportation
United States Coast Guard
Ninth Coast Guard District
Marine Safety Division

1. Comment: The above referenced Draft Environmental Impact Statement has been reviewed by this office and at this time we have no comment to offer.

U. S. Department of Transportation
United States Coast Guard
Office of Marine Environment and Systems

1. Comment: The Department of Transportation has reviewed the material submitted. We have no comments to offer nor do we have any objection to this project.

2. Comment: The opportunity to review this draft statement is appreciated.

Advisory Council on Historic Preservation

1. Comment: This is in response to your request of May 28, 1975 for comments on the draft environmental statement for the mitigation of shore damage at Port Sanilac, Michigan. Pursuant to its responsibilities under Section 102(2)(C) of the National Environmental Policy Act of 1969, the Advisory Council on Historic Preservation has determined that your draft environmental statement appears procedurally adequate.

2. Comment: However, we have the following substantive comments to make:

To insure a comprehensive review of historical, cultural, archaeological, and architectural resources, the Advisory Council suggests that the final environmental statement contain evidence of contact with the appropriate State Historic Preservation Officer and that a copy of his comments concerning the effects of the undertaking upon these resources be included in the statement. The State Historic Preservation Officer for Michigan is Dr. Martha Bigelow, Director, Michigan History Division, Department of State, Lansing, Michigan 48918.

Response: A copy of the draft of this environmental statement was sent to the State Historic Preservation Officer; her comments are published herein.

United States Environmental Protection Agency
Region V

1. Comment: We have completed our review of the Draft Environmental Impact Statement (EIS) for Mitigation of Shore Damage Attributed to the Federal Navigation Structures at Port Sanilac Harbor, Sanilac County, Michigan as requested in your letter of May 23, 1975. In general, the EIS adequately describes the proposed project and with some exceptions its potential environmental impacts. We do, however, have some comments to make which should be addressed in the Final EIS. As you know, our agency

has had considerable involvement in the project area. We have commented on the EIS for Breakwater Extensions at Port Sanilac and the EIS for the proposed Lexington Harbor of Refuge (11 miles south of Port Sanilac). We note that the former project has been delayed because of material delay.

Response: Referencing the Port Sanilac Harbor breakwater extensions, as of 31 August 1975, the aforementioned project is 82% (percent) complete.

2. Comment: In accordance with EPA procedures, we have classified our comments on this project as LO-2. Specifically, this means that we have no major objections to the project and that we believe additional information is required to fully assess the environmental impact of the project. The classification and date of our comments will be published in the Federal Register. If you have any questions regarding our comments please contact Mr. Gary A. Williams at 312-353-5756. We appreciate the opportunity to review this Draft EIS.

3. Comment: Since this proposal constitutes a Section 404 action, Section 404(b) guidelines should be considered in implementing the proposal.

Response: Corps Civil Works are excluded from Section 404 of the Federal Water Pollution Control Act (P.L. 92-500, 86 Stat. 816, 33 U.S.C 1344).

To clarify, Section 404 authorizes the Secretary of the Army, acting through the Chief of Engineers, to issue permits, after notice and opportunity for public hearings, for the discharge of dredged or fill material into navigable waters at specified disposal sites. The selection of disposal sites will be in accordance with guidelines developed by the Administrator of the Environmental Protection Agency (EPA) in conjunction with the Secretary of the Army.

4. Comment: Since it has been assured in the EIS that the proposed fill material for beach formation and nourishment measures will be clean, unpolluted sand, analysis of the fill's chemical composition would not be necessary. However, a qualitative statement should be provided in the Final EIS that the fill material will not exceed EPA's bottom sediment criteria for determining the fill's acceptability for disposal in and along Lake Huron.

Response: Such a statement has been added to the text. The fill material will not exceed EPA's and the Corps of Engineers' bottom sediment criteria for determining the fill's acceptability for disposal in and along Lake Huron. (Please see Section 1, paragraph 1.36).

5. Comment: Section 5.04 of the EIS states that "water quality in the area to be dredged would temporarily be affected in an adverse manner." This statement should be clarified as it was our belief that dredging was not a part of the proposed action, only the deposition of fill material.

Response: The observation is correct. Dredging is not a part of the proposed action, only the deposition of fill material. The referenced typographical error has been corrected.

6. Comment: As 30,000 cubic yards/per year (cy/yr) of drift is either being interrupted or diverted to deep water, the project's purpose is to replenish 90,000 cy initially and 30,000 cy annually of beach nourishment in the zone of influence. Yet the EIS indicates that based on volumetric erosion rates, the percent of erosion attributable to Port Sanilac Harbor is 43 percent. The figures derived from taking 43 percent of the volumetric erosion rates (Section 2,32) for those shorelines not protected in the zone of influence and the figure presented for the total nearshore erosion attributable to the Federal Navigation Project at Port Sanilac are considerably

less than either the project's initial and annual fill quantities. As authorization under Section 111 (P.L. 92-483) provides only for mitigation of erosion in excess of the natural rate, the Final EIS should clarify this substantial difference and the difference between the figure of 30,000 cy/yr of material interrupted and/or diverted by the Federal Navigation project and the figure of 12,212 cy/yr representing the total nearshore erosion attributable to the Federal project. For further clarification, see response to cmt. 4 , FEIS pg. 73 .

Response: The erosion south of Port Sanilac Harbor contributes 14,650 cubic yards of material to littoral transport. However, the structures trap or divert 30,000 cubic yards annually. Therefore, periodic (annual) nourishment requirements equal this amount. The initial placement quantity will be 90,000 cubic yards or a three year supply. This quantity is considered sufficient to supply any extreme demands by local littoral processes.

7. Comment: According to the EIS, the initial 90,000 cy and subsequent annual 30,000 cy of unpolluted beach fill will be obtained from commercial borrow pits and transported by truck; but the borrow sites have not yet been designated. The Final EIS should indicate the location of the pit areas and describe the local environmental impacts of removing fill from them.

Response: As indicated in Section 1, paragraph 1.12, the exact pit site or sites for supply will not be decided upon until Plans and Specifications Stage. In view of the aforementioned, full detailed consideration of environmental impacts cannot be evaluated at this time for source site(s) still to be designated. However, please see Section 4, The Environmental Impact of the Proposed Action, and Section 5, Adverse Environmental Effects Which Cannot Be Avoided Should the Proposal Be Implemented, for a description of anticipated environmental impacts based on inspection of several typical existing commercial pits located in Sanilac County.

8. Comment: Wherever the material is obtained, a satisfactory sediment erosion control plan should be conditioned upon the contractor.

Response: Agreed, please see Section 1, Project Description, subsection addressing Environment Protection - Scope, paragraphs 1.[illegible] through 1.53. However, this Agency cannot as a matter of policy, directly exercise that degree of control on a supplier such as a commercial [illegible] pit owner if that owner is anyone other than the Contractor selected to perform the proposed mitigation plan. This is especially evident in that, as indicated in Sections 4 and 5 regarding this matter of local jurisdiction, even the State of Michigan has no control over uncon[illegible]ated pits (sand and gravel open pit mining). This is further evidenced by the specific exclusion of mining operations from Michigan's recently enacted and implemented Sedimentation and Erosion Control Act. Further, Sanilac County and the Townships located therein have not enacted any Mineral Mining Control Ordinances. Nevertheless, the lack of regulatory control

on this area of the environment and the fact that investigated pits are now degraded does not eliminate the potential for environmental enhancement. Therefore, keeping the aforementioned in mind, under technical provisions of any contract awarded pursuant to completion of the proposed mitigation plan, it could be so stipulated that the Contractor will agree to assure compliance with this obligation by all subcontractors such as a commercial sand pit owner-supplier. However, the difficulty and practicality of successfully obtaining interested bidders and awarding such a contract containing the referenced clause may preclude such a provision from being written into the contract. This decision will be made at the Plans and Specifications stage pending a thorough analysis of the trade offs (pit control versus no project at all) involved.

9. Comment: Transport trucks should be sprayed or covered if dust is generated during haulage.

Response: Agreed, please see Section 1, Project Description, subsection addressing Dust Control.

10. Comment: The EIS should indicate the number and permanency of the proposed hopper conveyor system(s) and whether any permanent facilities will be landscaped to reduce their visual impact.

Response: As indicated in Section 1 of the FEIS, paragraph 1.12, it is anticipated that a (one) temporary hopper-conveyor system would be utilized to place some source material over the bluff to the beach site where it would be spread into place by earthmoving equipment. Since the hopper-convevor system will be of a temporary nature, landscaping to reduce its visual impact is not contemplated.

11. Comment: Areas impacted by construction activities should also be seeded and landscaped for protection from erosion.

Response: Please see Section 1, paragraph 1.50, Restoration of Landscape Damage, where the aforementioned is addressed.

12. Comment: Rather than impacting land resources, consideration should be given to alternate sources of clean feeder beach material such as from deep water areas or offshore shoals.

Response: At this time we have no knowledge of offshore deposits of sufficient size to handle the anticipated demand. At an undetermined time in the future the Corps will conduct an ICONS (Inner Continental Shelf Program) Study of Lake Huron including the subject area in an attempt to locate and define offshore sand deposits.

13. Comment: Effective implementation and enforcement of the pollution control and restoration programs described in the EIS during construction and continued operation of the proposed action should substantially minimize the project's adverse environmental impacts.

Response: Through these and other measures the Corps endeavors to attempt to minimize adverse effects of all of its projects.

United States Department of Commerce
The Assistant Secretary for Science and Technology

1. Comment: The information on climate is very general, brief, and contains no specifics. In view of the important relationship between storms and erosion, the statement would be enhanced if quantitative data on storms, with the emphasis on windspeeds and direction, were included. Climatological data are available from the National Climatic Center, Asheville, North Carolina 28821.

Response: No quantitative data on storms at Port Sanilac is available from the National Climate Center; however, please see the expanded subsection addressing Winds contained in Section 2, Environmental Setting Without the Project.

2. Comment: Improvement of Lake Huron shoreline south of Port Sanilac will consist of an initial protective beach containing approximately 90,000 cubic yards of unpolluted sand fill and subsequent feedings at a rate of 30,000 cubic yards per year (paragraph 1.12). The statement does not provide justification for the amount of sand needed for initial formation of the beach and for subsequent annual feedings, except that the annual nourishment should be equal to the amount of littoral drift which was interrupted or diverted into deep water by the harbor construction. There are no form rules to determine the quantity of sand needed for initial beach formation. It should provide compensation for sand lost over longer period of time. For this reason, the initial fill of 90,000 cubic yards appears to be reasonable.

Response: Agreed. The erosion south of Port Sanilac Harbor contributes 14,650 cubic yards of material to littoral transport. However, the structures trap or divert 30,000 cubic yards annually. Therefore, annual nourishment requirements equal this amount. The initial emplacement quantity will be 90,000 cubic yards or a three year supply. This quantity is considered sufficient to supply any extreme demands by local littoral processes.

3. Comment: As stated above, the annual nourishment should be equal to the amount of littoral drift interrupted by the harbor structures. Paragraph 2.29 provides data on littoral drift from north to south past Port Sanilac. Interrupted drift was deposited at various locations and the drift rates were determined from the annual accretion rates as follows:

At the beach and nearshore area north of harbor....11,000 cubic yards.

In the harbor....16,000 cubic yards.

In the nearshore area lakeward and adjacent to the north breakwater....3,000 cubic yards.

Total annual deposition along the beach within the breakwater, and immediately lakeward of the north breakwater....8,000 cubic yards.

These figures are quite confusing. The first three items add up to 30,000 cubic yards; however deposits in the harbor should definitely be excluded from the littoral transport. Sampling by the Environmental Protection Agency indicated that deposits in the harbor consist of 100 percent ooze. The remaining accretion figures do not add up to 30,000 cubic yards. It appears that in this case, the correct estimate of interrupted littoral transport should include accretion at the beach and the north breakwater, estimated erosion from the above by the stroms from the east, and deposition at the entrance channel and in deeper parts of the lake.

Response: The information presented has been analyzed correctly, however, the U. S. Environmental Protection Agency - Great Lakes Surveillance Branch indicates that, based on sampling of the harbor by that agency in 1975, the quality of the sediments has improved considerably since 1970. EPA has indicated (please see Appendix A) that all sediments in Port Sanilac Harbor are now acceptable for unrestricted open lake disposal. The referenced paragraph has been expanded, revised and clarified, including reference to the time element involved which is the key to the understanding of the problem. Please see Section 1, paragraphs addressing Shore Processes, Sediment Budget and Littoral Drift and Erosion Rates.

4. Comment: In addition, the information on volumetric erosion rates does not justify the rates of annual feeding. Paragraph 2.33 states that "total nearshore erosion attributable to the Federal navigation project is about 12,212 cubic yards per year. Total nearshore erosion is 28,400 cubic yards per year." From this, one can conclude that annual beach feeding at the rate of 3 ,000 cubic yards will be about two and a half times larger than erosion attributable to Federal project and exceed even the total erosion from both the natural causes and the Federal project.

Response: The comment is confusing the data presented in the EIS. There is not a direct linear relationship between littoral drift blocked by the Port Sanilac Harbor structures and total nearshore erosion attributed to those same harbor structures. Please refer to Section 2, expanded and revised paragraphs addressing Shore Processes, Sediment Budget and Littoral Drift and Erosion Rates for further clarification.

5. Comment: The statement does not discuss in detail alternate sources for the unpolluted sand fill, although it says that land borrow and offshore

borrow areas were considered as potential sources of feeder beach material (paragraph 1.25). It is suggested that review be made of an offshore borrow area near Port Sanilac.

Response: As indicated in Section 2, Environmental Setting Without the Project, subsection addressing Littoral Materials, sediment samples were taken in June 1972 and June 1973, within an area approximately 1,200 feet north to 19,000 feet south of Port Sanilac Harbor and including bluffs, backshore, foreshore and nearshore zones to as far out as approximately 2,500 to 3,500 feet from shore. As previously indicated in response to comment number 12 from the U. S. Environmental Protection Agency - Region V, at this time we have no knowledge of offshore deposits of sufficient size to handle the anticipated demand. At an undetermined time in the future the Corps will conduct an ICONS (Inner Continental Shelf Program) Study of Lake Huron including the subject area in an attempt to locate and define offshore sand deposits.

6. Comment: Location and dimensions of the pit should be such that it would intercept the littoral drift diverted into deep lake and also drift deposited in the entrance channel. This would eliminate the maintenance dredging of the entrance channel and would provide clean, well-sorted sand for beach fill.

Response: As indicated in Section 2, subsection addressing Sediment Budget and Littoral Drift, presently the beaches north of the structures appear to be accreting at the reduced rate of 1,000 cubic yards annually. The area lakeward of the north breakwater is accreting for another 1,000 cubic yards annually. The deposit lakeward of the harbor entrance is growing at the rate of 6,000 cubic yards annually. In addition, the sediment analysis done in 1972 indicates that about 4,800 cubic yards annually are fine sediments which would be carried farther lakeward. Thus, from the aforementioned, it is obvious that annual accretion, whether trapped in a subaqueous pit or not is not of sufficient volume and/or gram size to handle the anticipated demand for an initial 90,000 cubic yards and subsequent periodic 30,000 cubic yards of clean fill meeting both gradation and environmental requirements.

7. Comment: It seems that specific size gradation to satisfy the requirements of optimum fill material (paragraph 1.25) is superfluous. That requirement is to provide stable beach with minimum erosion and movement of beach material. In this project, however, the fill areas should serve to create a stream of littoral drift in order to reduce erosion of the entire length of shoreline instead of a limited length within the feeder beach.

Response: It is considered that if the source material does not have a gradation that would satisfy the requirements of optimum fill material for both initial construction and periodic nourishment and instead contains clay and/or silt sized particles or too much fine sand, those same sediments would generally be too fine to substantially contribute to the littoral drift. Thus they would be lost offshore to deep water.

8. Comment: The statement indicates that the source material obtained from land borrow areas could be transported by truck, then placed over the bluff by hopper-conveyor system where it would then be spread into place by earth moving equipment. As the statement correctly judges, utilization of the aforementioned plan would cause inconvenience to motorists using residential streets, and diesel fumes would irritate residents living along these streets as would the noise from the trucks, earth moving equipment, and hopper-conveyor systems. It is suggested that in connection with sand from offshore borrow area, transport of the sand be accomplished by shallow draft barges. Placement of sand in shallow water near the shore can be either by pumping or by bottom dumping. Distribution of the sand should be left to natural forces of the lake, such as waves, currents, and ice cover. Similar methods of sand transport and placement are employed on some Lake Michigan harbors. No difficulties are apparent for application of the same methods on Lake Huron. From superficial examination of several projects, it appears that transport of sand over water routes instead of land is less costly and would result in significant savings of public funds.

Response: Work recommended for construction pursuant to Section 111 must provide the most practical and economical means of mitigating that erosion, in excess of the natural rate, which is attributable specifically to Federal navigation structures. Please see previous responses to Comments 5 and 6 by the U. S. Department of Commerce - The Assistant Secretary for Science and Technology and the previous response to Comment number 12 from the U. S. Environmental Protection Agency - Region V.

United States Department of the Interior
Office of the Secretary

1. Comment: The overall approach used in the preparation of the environmental sections of the impact statement has resulted in some generalities and ambiguities. Although it appears from the description of the project environment that there will be minimal damage to flora and fauna, assessment of the impact is tenuous because of the paucity of data presented.

Response: The Council on Environmental Quality has encouraged agencies to streamline their impact statements by focusing most of their efforts on a discussion of the environmental effects of the proposal and its alternatives. Within this area of focus, the Corps has concentrated on the most important findings or conclusions in our analysis. The purpose of the impact statement process is to help develop an environmentally sound project; it is not to develop a lengthy document which may obscure the major issues.

2. Comment: Generally, the description of the environmental setting at the project sites (the initial protective beach and subsequent feeder

beaches) is not adequate. The inclusion of photographs of the bluffs and the land areas between highway 25 and the bluffs would greatly enhance the statement.

Response: Agreed, please see Section 2, where the existing verbal descriptions of shore segments have been augmented by the addition of Plates 7, 8 and 9.

3. Comment: Expanded discussion is also needed regarding the physical dimensions of the hopper-conveyor system and how this system may affect trees, shrubs, and terrestrial wildlife in the project area.

Response: Please refer to the previous response to Comment number 10 from the U. S. Environmental Protection Agency - Region V.

4. Comment: Project Description. The reader's understanding of the need for the project would have been greatly enhanced by the inclusion of photographs in the environmental impact statement showing shore erosion south of the Port Sanilac breakwaters. We suggest the final statement include such photographs.

Response: Please refer to the previous response to comment number 2 from the Department of the Interior - Office of the Secretary.

5. Comment: Also, we urge that Plate 2 be revised for the final statement to clearly indicate the extent of protective and feeder beaches which will be created under the project. Additionally, it would be helpful if Plate 2 were to show the boundaries of the State roadside park.

Response: Please see the revised Section 2, Environmental Setting Without the Project, where graphic descriptions of the aforementioned have been added to supplement the existing verbal descriptions.

6. Comment: The materials to be obtained from unspecified pits and deposited at the beach-nourishment sites have been described only as unpolluted sand or as clean sand (page 7, paragraph 1.32).

Response: Please see previous response to Comment number 7 from the U. S. Environmental Protection Agency - Region V.

7. Comment: In addition, the character of material present at the proposed deposition site has not been described, except in highly general terms, although sampling has evidently been extensive. For example, it is stated that surface samples were taken in the bluff, backshore, foreshore, and nearshore area, but information on specific locations, times, and results of this sampling have not been provided (page 17, paragraph 2.21).

Response: Please see previous response to Comment number 5 from U. S. Department of Commerce - The Assistant Secretary for Science and Technology.

8. Comment: The only indication of analytical results is that "optimum fill material has a mean diameter of .31 mm" (page 3, paragraph 1.09), without further explanation of how that figure was derived.

Response: The aforementioned may be found in Appendices D and F of the Port Sanilac Harbor Section 111 Detailed Project Report available for review in the Corps Detroit District Office, 150 Michigan Ave., Detroit, Michigan 48226.

9. Comment: Referencing subsection 1.33, the statement should provide evidence of consultation with the State Historic Preservation Officer concerning properties in the project area which may be eligible for inclusion on the National Register of Historic Places.

Response: Please refer to Appendix D where a copy of a letter from the State Historic Preservation Officer indicates that the project will have no impact upon cultural resources in the vicinity (of the project).

10. Comment: The final statement should also reflect the results of any archaeological survey work and any recommendations for preservation of archaeological resources or mitigation of project impact. An important objective of such an investigation should be to locate and assess such resources with regard to their National Register eligibility (refer to 36 CFR 800).

Response: Please refer to the previous response to Comment number 9 from the Department of the Interior - Office of the Secretary, and to Section 2, subsection addressing Historical and Archaeological Sites.

11. Comment: Environmental Setting. Paragraph 2.71, page 35. Reference is made in this section to "previous indigenous fish populations" that were affected by harbor dredging. However, there is no discussion or list provided for those fish species that may currently be utilizing the littoral zone which will be altered by the beach nourishment project. Current fish data applicable to the project site should be provided in the statement.

Response: As indicated in the DEIS (and this FEIS) in Section 2, subsection addressing Existing Ecological System of the Beach, Nearshore Zone and Lake, paragraphs just preceding the referenced paragraph, the current fishery is described including recent sports fishery plants by the Michigan Department of Natural Resources.

12. Comment: Paragraph 2.72, page 35. Since the mitigation of shore damage project will not involve Port Sanilac Harbor itself, inclusion of an analysis of the harbor's benthic populations is not really applicable. Presentation of macro-invertebrate data at the proposed beach nourishment sites would be of greater value.

Response: As previously indicated, offshore borrow areas, including sediments located with the harbor, were considered as potential sources of feeder beach material. Although the EPA has recently reclassified harbor sediments as suitable for open lake disposal, grain size requirements preclude those sediments from being utilized as feeder beach source material. Harbor benthic population data was obtained in conjunction with harbor sediment data to serve as an index to the degree of pollution or non-pollution of harbor sediments and were presented in the EIS as such. Subsequently, inquiry into the availability of macro-invertebrate data for the referenced littoral zone was made of the Michigan Department of Natural Resources; the University of Michigan Great Lakes Research Center, Ann Arbor, Michigan; and the U. S. Fish and Wildlife Service, Lansing, Michigan. The inquiry revealed that while not typical of the littoral zone, the harbor benthos population data was the only data available for the Port Sanilac area.

13. Comment: Environmental Impacts. It is stated in paragraph 1.12 on page 4 that, "The exact pit site or sites for (sand fill) supply will not be decided upon until Plans and Specifications Stage." The extraction of 90,000 cubic yards of sand initially and thereafter up to 30,000 cubic yards per year may have a significant environmental impact on existing or potential recreation resources. Thus, we strongly urge that the final statement indicate the possible pit sites and include a discussion of the environmental impacts of the long-term extraction of sand from each site should it be selected to provide the sand fill.

Response: Please see previous response to Comment number 7 from the U. S. Environmental Protection Agency - Region V.

14. Comment: We suggest the final statement indicate the season and length of time during which project activities would be taking place at the State roadside park because during these periods of time public use of the park beach would be curtailed or prohibited.

Response: The aforementioned is addressed in Section 1, paragraph 1.21.

15. Comment: Since the project is expected to make the beaches more attractive to recreational use, decrease bluff erosion, and improve the project area's aesthetics, it may engender a significant level of vacation and retirement home construction in the project area. We urge that this secondary environmental impact be addressed in the final statement.

Response: The provision of an initial feeder beach and subsequent periodic nourishment would mitigate bluff erosion due to the navigation project until that nourishment has reestablished a simulated natural pattern of littoral drift. Creating a beach would approach a natural condition that might exist were it not for the navigation project. Decreasing bluff erosion would serve to decrease the turbid water conditions in these areas so that the resulting beaches would be aesthetically pleasing as well as

useful for recreational bathing and surf fishing, hence, a return to conditions that existed prior to construction of the harbor structures. Thus, it is not anticipated that the proposed mitigation plan would engender a significant level of vacation and retirement home construction in the project area. Further, the natural occuring erosion rate is probably severe enough to preclude additional shoreline construction.

16. Comment: Adverse Effects. Paragraph 5.05, page 44. It would be helpful to define what is meant by the term "mass wasting" as it affects the unstable bluffs.

Response: "Mass wasting" can be defined either as the slow downslope movement of rock debris or used as a general term for a variety of processes by which large masses of earth material are moved by gravity either slowly or quickly from one place to another.

17. Comment: Information presented in the Project Description, page 1, and the Plan of Improvement, page 3, implies that the project will in no way involve the interior area of Port Sanilac Harbor. However, paragraph 5.04, page 44, suggests that the project will involve dredging of harbor sediments. This should be clarified.

Response: Dredging is not a part of the proposed action, only the deposition of fill material. The referenced typographical error has been corrected.

18. Comment: Alternatives. It is evident from information provided in the draft environmental statement that significant losses may result from future erosion, whether attributable to the Federal structures or to natural causes. For example, as a result of past erosion in the problem area, it has been observed that "presently large trees and other vegetation are falling into the lake, personal properties and homes are being lost, other homes are also threatened" (page 39, paragraph 7.01). It has also been noted that "private individuals have constructed numerous structures with little or no coordination" (page 38, paragraph 7.23). In spite of these circumstances, none of the alternatives that have been considered include governmental efforts to encourage, require or coordinate measures by local owners to protect existing shoreline environment from further damage. Although the Corps itself may lack direct authority or responsibility in the matter, we believe it could highlight the need and suggest ways in which State and/or local government could attack the problem.

The alternative of shoreland regulation and management techniques would evidently be directed solely toward preventing unwise future development (page 11, paragraph 3; page 45, last paragraph). Since factors contributing to bluff erosion include groundwater seepage and sheet erosion (page 2, paragraph 1.06), it is suggested that the mitigation plan include advising and encouraging local owners, through state and/or local government as appropriate, to apply measures to their own land designed to control such erosion, and to contribute generally to control of natural erosion along the bluffs adjoining the proposed beach-nourishment project.

Response: In 1968, the 90th Congress authorized a National appraisal of shore erosion and shore protection needs. This National Shoreline Study and the existing Federal shore protection programs recognize beach and shore erosion as problems for all levels of government and all citizens. To satisfy the purposes of the authorizing legislation a family of 12 related reports has been published. All are available to concerned individuals and organizations from the Superintendent of Documents, U. S. Printing Office, Washington, D. C. 20402. The reports include the following:

Regional Inventory Reports (one for each of the 9 major drainage areas) (in 5 volumes) assess the nature and extent of erosion; develop conceptual plans for needed shore protection; develop general order-of-magnitude estimates of cost for the selected shore protection; and identify shore owners (Federal, State, local, private, public). The Great Lakes Region Inventory Report is part of "The National Shoreline Study" and constitutes volume V of that study. Volume I contains Shore Protection Guidelines and Shore Management Guidelines.

Shore Protection Guidelines describe typical erosion control measures and present examples of shore protection facilities, and present criteria for planning shore protection programs.

Shore Management Guidelines provide information to assist decision makers to develop and implement shore management programs.

Report on the National Shoreline Study, addressed to the Congress, summarizes the findings of the study and recommends priorities among serious problem areas for action to stop erosion.

Another excellent guideline is the Shore Protection Manual, Volumes I, II, & III, prepared by the U. S. Army Coastal Engineering Research Ctr., Corps Engineers, 1973. This pertinent work is also for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The Stock Number is 008-022-00077.

Finally, reference is made to the U. S. Army Corps of Engineers pamphlet entitled "Help Yourself." This fold-out pamphlet contains an illustrated discussion of the critical erosion problems on the Great Lakes and alternate methods of shore protection. This pamphlet is available from the U. S. Army Engineer North Central Division 536 South Clarke Street, Chicago, Illinois 60605.

STATE AGENCIES

Michigan Department of State
Michigan History Division
State Historic Preservation Officer

1. Comment: Staff members of the Michigan History Division have reviewed the following Draft Environmental Statement:

Mitigation of Shore Damage Attributed to the Federal Navigation Structures at Port Sanilac Harbor, Michigan.

We conclude that the project will have no impact upon cultural resources in the vicinity.

Michigan Department of Natural Resources

1. Comment: The statement adequately describes the project and the environmental impacts related to it. However, we would point out a few areas where more information would be helpful. It would be very helpful if a map were provided showing the amount and area of artificial accretion and amount and area of accelerated erosion. Additional comments will address page and paragraph in the text.

Response: Agreed. Please see Plates 3 through 6 found in Section . of the E.I.S.

2 Comment: Page 1, paragraph 1.04. In regard to the "limits of the Section 111 authority," a discussion should be added as to whether more permanent measures could be entered into if private citizens have any additional costs above the cost of mitigating effects of the navigation structures.

For example, the alternatives might logically include the purchase of the fronting properties or at least the purchase of the rights to damage the property because of the erosion. Evacuation should be a viable alternative because of the high risk erosion area setbacks under Michigan's Shorelands Management and Protection Act is indeed based upon a 30-year erosion rate (which is the amortization of the cost of building). Furthermore, it seems that a stable profile should eventually be reached for the formation of a beach from accumulated sediments, probably cobble or gravel. This alternative might include giving the owners the opportunity to sell or reach an agreement by reimbursement of damages caused by Corps activities. Presumably, at some point, the up current accretion behind the structure should be completed, and sand would then carry across the mouth to reaccumulate on the down side of structure, thereby reestablishing the beach.

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MITIGATION OF SHORE DAMAGE ATTRIBUTED TO THE FEDERAL NAVIGATION--ETC(U)
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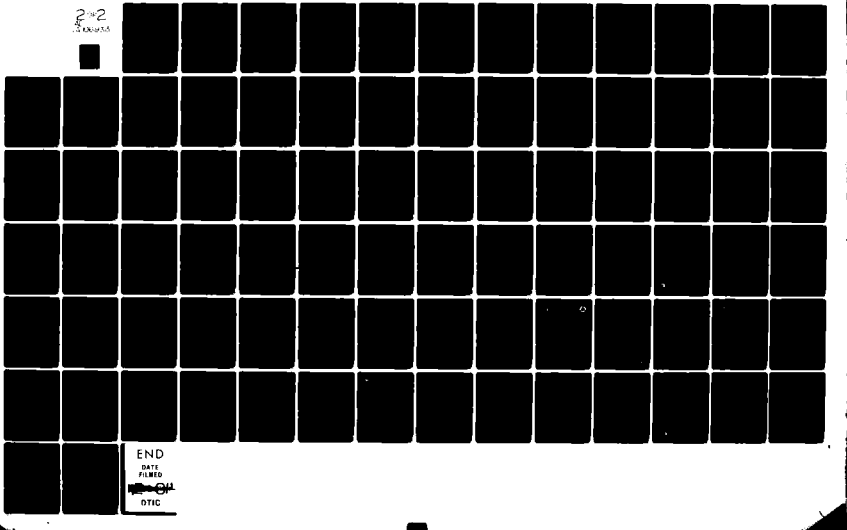

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Response: The goal and authority of Section 111 is to mitigate damage attributable to the navigation structures; monetary compensation for such damage is not compatible with such authorization. Presently, losses due to damages caused by Federal structures are tax deductible as authorized by the Internal Revenue Service. Thus, monetary compensation would result in a double benefit for affected landowners. In addition, property farther inland would be endangered as erosion continued, necessitating additional mitigative measures. Evacuation and moving of structures would not be warranted even if the cost thereof would be less than the cost of shore protection by other means. Evacuation is rarely acceptable to the interests concerned; if it were, it is likely that the evacuated area would later require direct protection and/or additional evacuation, as the originally evacuated area was eroded and lost.

3. Comment: The alternative might also logically include pumping sand from the accretion site north of the Harbor to the enrichment area south of the Harbor (thereby restoring natural process). This would be a two edged sword -- it would restore the beach and would avoid a future need to dredge the sand bar which will eventually form over the harbor mouth, if the accretion continues until it reaches the mouth. It would also establish the legal right of the Corps to manipulate accretion in accordance with historic "before structure" processes.

Response: There is not enough sand present in the accretion area to handle the demand without damaging property located immediately to the north of the structure. In addition, an eductor system (fixed sand bypass system); may be undesirable due to local septic system discharging or leaking into Lake Huron. Further, recent studies have indicated the ineffectiveness of eductor systems, thereby eliminating them from consideration. Consequently, the aforementioned option was not considered as an alternative in the planning process and as such was not addressed in the Detailed Project Report (The Decision Document). Consequently, cognizant that the EIS must reflect that data presented in the Decision Document, the alternative addressing the use of an eductor system has been deleted from the FEIS. The option addressing extension of erosion insurance under Sec. 108 of the National Disaster Act of 1973 was also not considered as an alternative in the Decision Document. Therefore, it also was deleted from the presentation of alternatives considered in the FEIS.

4. Comment: Page 4, paragraph 1.14. It is stated that "when the lake level is above 579.8 feet, lands above that point are also in the public trust." More correctly the reference should be to "submerged lands" above that point.

Response: The observation is correct. The referenced paragraph has been corrected.

5. Comment: Page 6, paragraph 1.28. Procedures and guidelines should be comprehensively outlined for the contractors engaged to perform this work. This should be discussed in the statement.

Response: The aforementioned is discussed throughout Section 1, subsection addressing Environment Protection - Scope, paragraphs 1.26 through 1.48.

6. Comment: Page 34, paragraph 2.68. With reference to the data on Lake Huron fish population, commercial fishing data is available to date; sport fishing data is available up to 1974; and data is available on fish populations in the lake. These data can be obtained from the DNR Fisheries Division and U. S. Fish and Wildlife Service.

Response: The referenced data, provided by Mr. Ned E. Fogle, Great Lakes Specialist, Fisheries Division, Michigan Department of Natural Resources, has been included in this FEIS. Please refer to Section 2, subsection addressing Existing Ecological System of the Beach, Nearshore Zone and Lake, and Appendix C, Pertinent Correspondence.

7. Comment: Page 40, paragraph 3.15. This subsection refers to "ocean waters" and we fail to see its applicability to this project.

Response: While not directly applicable, the referenced two words and their containing sentence were retained within the text to retain the letter and spirit of the definitions given for the purpose of issuing or denying authorizations for permits to private persons or corporations, non-governmental developers or other agencies that may effect the plans of such river basin commissions established under the Water Resources Planning Act (42 U.S.C. 1962).

8. Comment: Page 41, Section 4. We believe the secton on environmental impacts of this action should include the impact that will result from the consumption of land based sand, and the inland areas disrupted by the mining activity. The sand which is proposed to be mined is a non-renewable resource which will be lost to the upland once placed in the water. This impact should also be repeated in Section 5 under unavoidable adverse effects.

Response: Agreed. Please see revised Sections 4, The Environmental Impact of the Proposed Action, and 5, Adverse Environmental Effects Which Cannot be Avoided Should the Proposed be Implemented. Also please refer to previous response to Comment Number 7 from the U. S. Environmental Protection Agency - Region V.

9. Comment: Page 15, paragraph 2. It is stated that an almost continuous seawall and numerous groins now protect the shoreline for a distance of 4,400 feet south of the harbor. Even though erosion in this area is considered minimal, it would seem in part due to the effects of the navigation structures. Was some measure of nourishment considered for the beach in this area?

Response: Nourishment was considered for this area but was rejected for the following reasons:

a. Actual measurements show no erosion in this area.

b. However, there are errors in the method of measurement.

c. Therefore, as the erosion rate here is not measurable, the amount of erosion attributable to the harbor could not be accurately determined. Thus, utilizing conservative judgement, erosion was indicated as being minimal.

d. Also, since the erosion rate is so low, it is doubtful that placing sand along this stretch of shoreline would have any tangible benefits.

e. Finally, the presence of groins would prevent movement of substantial quantities of material, thereby not alleviating the more severe problems downdrift.

GLOSSARY

accretion - natural accretion is the gradual build-up of land over a long period of time solely by the action of the forces of nature, on a BEACH by deposition of water- or air-borne material. Artificial accretion is a similar build-up of land by reason of an act of man, such as the accretion formed by a groin, breakwater, or beach fill deposited by mechanical means.

agriculture and undeveloped lands - this type of shoreland use includes croplands, pasturelands, and all vacant and undeveloped lands except forests and wooded areas.

artificial nourishment - the process of rebuilding a beach by the replenishment of beach materials by artificial means such as the deposition of dredge spoil.

artificial shore type - an area of the shoreland that has been artificially modified by man through the placement of structures, by filling, or by dredging so that the original natural shoreline no longer exists.

backshore - that zone of the shore or beach that lies landward of the foreshore which is usually dry and only affected by wave action generated by severe storms.

barrier beach - a bar formed from the bottom materials lying parallel to the shore, the crest of which is above high water.

bay - a wide indentation of the shoreland formed by a lake.

beach - a shoreland zone of unconsolidated material that extends landward from the shoreline to the place where there is a marked change in material or physiographic form or to the line of permanent vegetation. The lakeward limit of a beach includes the foreshore and backshore.

beach berm - a nearly horizontal portion of the beach or backshore formed by the deposit of material by wave action. Some beaches have no berms, others have one or several.

beach erosion - the carrying away of beach materials by wave action, tidal currents, or littoral currents, or by winds.

beach width - the horizontal dimension of the beach as measured normal to the shoreline.

benthos - the group of organisms which comprise the aquatic bottom community.

berm - a low, relatively flat bench lying between the landward limit of the backshore and the lakeward limit of the bordering upland shore.

bluff - a high, steep bank or cliff. For the purposes of this study, bluffs have been classified in four different ways as follows:

HBE - a high bluff, 30 feet above the shoreline or higher and composed of erodible materials.

HBN - a high bluff, 30 feet or higher, non-erodible.

LBE - a low bluff, less than 30 feet high and composed of erodible materials.

LBN - a low bluff, less than 30 feet high and composed of non-erodible materials.

breakwater - a structure for breaking the force of waves to protect craft anchored in a harbor or to protect a beach from erosion. An offshore barrier may be either an artificial structure or a natural formation. Sometimes it is connected at one, or both, ends with the shore.

bulkhead - a low wall of stones, concrete or piling built to protect a shore, or fills, from wave erosion. A bulkhead may be built to protect navigable waters and serve as a line, limiting filling, or beyond which filling of submerged lands is not permitted.

(cm.) centimeter - a measure of length equal to 100th of a meter (.3937 inch).

coastal area - the land and sea area bordering the shoreline.

coast line - (1) technically, the line that forms the boundary between the coast and the shore; (2) commonly, the line that forms the boundary between the land and the water.

commercial - this type of shoreland use generally includes buildings, parking areas and other lands directly related to retail and wholesale trade and business and professional services. Examples of commercial land uses are stores, gas stations, motels, marinas, professional buildings and restaurants.

contour - (1) a line connecting the points, on a land or submarine surface, that have the same elevation; (2) in topographic or hydrographic work, a line connecting all points of equal elevation <u>above</u> or <u>below</u> a datum plane.

conventional pollutants - phenols, phosphorous, nitrogen, iron, oil and grease, solids and heavy metals other than mercury.

crest length, wave - the length of a wave <u>along</u> its crest. Sometimes called crest width.

crest of wave - (1) the highest part of a wave; (2) that part of the wave above still water level.

current, coastal - one of the offshore currents flowing generally parallel to the shoreline with a relatively uniform velocity (as compared to the littoral currents). They are not related genetically to waves and resulting surf but may be composed of currents related to distribution of mass in lake waters (or local eddies), and wind-driven currents.

current, littoral - the nearshore currents primarily due to wave action, e.g., Longshore currents and Rip currents.

dike - a wall or mound built around a low-lying area to prevent flooding.

downdrift - the predominant direction of movement of littoral materials.

dredge spoil - material removed from the bottom of a lake or river by a process known as dredging.

drift - (1) the speed at which a current runs; (2) also, floating material deposited on a beach (driftwood); (3) a deposit of a continental ice sheet, as a drumlin; (4) sometimes used as an abbreviation of littoral drift.

dunes - ridges, mounds or hills of loose, windblown material, usually sand. Stable dunes are those which are covered with vegetation and generally not readily susceptible to erosion by wind or water runoff. Unstable dunes are those which are bare of vegetation and subject to movement or erosion by both wind and water. For the purposes of this study, dunes have been classified in two different ways as follows:

HD - high dunes, stable or unstable, rising 30 feet or higher above the shoreline.

LD - Low dunes, stable or unstable, less than 30 feet above the shoreline.

environmental areas - areas of the shorelands both upland and off-shore, which provide habitat for fish, wildlife and other aquatic life, contain unique populations of flora and fauna, or are otherwise ecologically significant.

erosion - the wearing away of the land by the action of wind, water, gravity or a combination thereof. Shoreland erosion on the Great Lakes is most often a result of a combination of (a) wind driving waves beating upon the shore and forming littoral currents, and (b) high water levels.

fetch - in wave forecasting, the continuous area of water over which the wind blows in essentially a constant direction. Sometimes used synonymously with fetch length.

fetch length - in wave forecasting, the horizontal distance (in the direction of the wind) over which the wind blows.

fish and game lands - this type of land use consists of all land areas managed for fish and game production, including wildlife and game preserves.

foreshore - that zone of the shore or beach lying landward of the shoreline which is usually wet and directly affected by all wave action.

forest - this land use consists of all public and private forested areas or woodlands which are not designated as recreational lands.

freeboard - the additional height of a structure above design high water level to prevent overflow. Also, at a given time the vertical distance between the water level and the top of the structure. On a ship, the distance from the water line to main deck or gunwale.

gabion - a specifically designed basket or box of corrosion resistant wire used to hold rock and other course aggregate. Gabions may be locked together to form groins, seawalls, revetments, deflectors, breakwaters and other protective structures for erosion control. Their flexible construction permits minor adjustments of alignment resulting from undercutting, filling and settling.

geomorphology - that branch of both physiography and geology which deals with the form of the earth, the general configuration of its surface, and the changes that take place in the evolution of land forms.

Great Lakes Basin - the hydrographic area defined by the drainage areas of Lake Superior, Lake Michigan, Lake Huron, Lake Erie, Lake Ontario, and the St. Lawrence Seaway to the Canadian-New York International Boundary Line and including all closed basins within the topographic divides separating the Great Lakes Basin from adjacent major drainages.

Great Lakes Region - the boundary of the Great Lakes Basin defined by selected county lines for statistical data availability and economic analysis.

groin - a shore protective structure (built usually perpendicular to the shoreline) to trap littoral drift or retard erosion of the shore. It is narrow in width and its length may vary from less than one hundred to several hundred feet (extending from a point landward of the shoreline out into the water). Groins may be classified as permeable or impermeable and may be manufactured of wood, concrete or steel. Impermeable groins have a solid or nearly solid structure. Permeable groins contain openings of sufficient size to permit passage of large quantities of littoral drift.

harbor - an area of water along the shoreline which affords shelter to commercial and recreational water craft. It may have been formed naturally or artificially, or by the artificial improvement of a natural shore feature. Harbors may be classified as commercial harbors or harbors-of-refuge. Commercial harbors are deep-draft harbors designed primarily for overseas or domestic vessels engaged in waterborne commerce. Harbors-of-refuge are small harbors along the shores of the Great Lakes located between commercial harbors and designed mainly to be a place of refuge for small recreational craft during storms.

height of wave - the vertical distance between the crest and the preceding trough.

high water line - in strictness, the intersection of the plane of mean high water with the shore. The shoreline delineated on the nautical charts of the Coast and Geodetic Survey is an approximation of the mean high waterline.

hopper dredge - a vessel equipped with two drag and suction pipes to "vacuum" the water floor and with hopper bins to store the dredged material which will finally be pumped into a disposal area.

industrial - this type of land use includes all industrial buildings, parking areas, adjacent yards and landscaped grounds. Included are warehousing, mining and other extractive industries, manufacturing industries, steel mills, private utilities and railroad facilities.

jetty - this term is used synonymously with groins on ocean sea coasts and are designed to prevent shoaling by littoral materials in channels. They are often constructed at the mouth of a river or tidal inlet to help deepen and stabilize the channel.

kilometer - a length of one thousand meters, equal to 3280.8 feet, or 0.621 of a mile. The chief unit for long distances is the metric system.

levee - a dike or embankment for the protection of land from inundation.

littoral - pertains to the shore, either or both the shoreland and shore waters and near-shore bottom of a lake.

littoral deposits - deposits of littoral drift.

littoral drift - the bottom materials moved in the littoral zone under the influence of waves and current. Direction of movement or "transport" of littoral material depends upon wind and wave direction.

littoral transport - the movement of material along the shore in the littoral zone by waves and currents.

low water datum - an approximation to the plane of mean low water that has been adopted as a standard reference plane.

marsh - a tract of soft, wet or periodically inundated land, generally treeless and usually characterized by grasses and other low growth.

monitoring program - an investigation before, during and after a project to study effects.

mooring facility - place where a ship is fastened.

nodal-zone - an area at which the predominant direction of the littoral transport changes.

non-structural measures - the management, utilization or control of water and related shorelands without structural development to achieve a desired goal or objective. Recommendations for non-structural measures for the shorelands of the Great Lakes in this study will often apply most reasonably to undeveloped portions of the shorelands.

offshore - in beach terminology, the comparatively flat zone of variable width, extending from the breaker zone to the seaward edge of the continental shelf.

pier - a structure extending out into the water from the shore to serve as a landing place, a recreational facility or to form a channel rather than afford shoreland protection.

pile - a long, slender piece of wood, concrete, or metal to be driven or jetted into the earth or sea bed to serve as a support or protection.

pile, sheet - a pile with a generally flat cross-section to be driven into the ground or sea bed and meshed or interlocked with like members to form a diaphragm, wall, or bulkhead.

plain - a low-lying, relatively flat shoreland which extends several hundred feet landward from the shoreline. For the purposes of this study, plains have been identified in two different ways as follows:

PE - a low plain consisting of erodible shoreland materials.

PN - a low plain consisting of non-erodible shoreland materials.

Pleistocene - the earlier of the two epochs comprised in the Quaternary period, in the classification generally used. Also called the Glacial epoch and formerly called Ice Age, Post-Pliocene, and Post Tertiary. Also, the series of sediments deposited during that epoch, including both glacial deposits and ordinary sediments.

pollutant - matter in the environment that exceeds established levels of tolerance set by man for his health, comfort and well-being.

profile, beach - the intersection of the ground surface with a vertical plane; may extend from the top of the dune line to the seaward limit of sand movement.

public buildings and related lands - this shoreland use includes all buildings and related grounds belonging to public or quasipublic agencies, governments, or organizations. This would encompass medical facilities, educational facilities, religious institutions, governmental administration and service buildings, military installations, water and sewage treatment plants, and airports.

pumpout station - a temporary dock where a connection is made between land and dredge pipes; a booster pump may be used.

recreation and other urban public use space - this shoreland use contains all designated public outdoor recreation lands and associated facilities. Privately owned outdoor recreation lands such as golf courses, tennis clubs, amusement parks, and race tracks are included. Cemetaries have been placed in this category as well.

residential - residential shoreland use has been defined to include four or more single or multi-family dwelling units adjacent to each other. Also included within this category are churches, elementary schools, small neighborhood parks, and small isolated commercial buildings, such as a neighborhood grocery store, within the boundaries of the residential area.

revetment - a facing of stone, concrete, etc., built to protect a scarp, embankment, or shore structure against erosion by the wave action or currents.

riprap - a layer, facing, or protective mound of stones randomly placed to prevent erosion, scour, or sloughing of a structure or embankment; also the stone so used.

rubble-mound structure - a mound of random-shaped and random-placed stones protected with a cover layer of selected stones or specially shaped concrete armor units. (Armor units in primary cover layer may be placed in orderly manner or dumped at random).

run-up - the rush of water up a structure on the breaking of a wave. The amount of run-up is the vertical height above still water level that the rush of water reaches.

scientific nomenclature - scientific nomenclature of animals requires (1) that each species and genus found in the world shall have a name that is <u>independent of change</u>, such as pertains to common names used

in many languages; (2) that each species and genus shall have separate names duplicated by none which refer to some other species or genus; and (3) that different names shall not be applicable to any one species or genus. The following is a breakdown of Categories of Higher Rank than Species and Genus:

Kingdom
Phylum
Class
Order
Family
Tribe
Genus
Species

Referencing the above, a glossary of fish families follows:

Family Clupeidae - the herring family. Members of this family live in large lakes and sluggish areas of large rivers. Most feed on plankton. Fresh water species have little commercial value but play an important role in the diet of many gamefishes. The gizzard shad and the alewife are prominent Great Lakes species.

Family Cyprinidae - the minnow family. Certain members of this family have adapted to living in diverse environmental conditions. Some minnows require water with a high dissolved oxygen content; others, such as the carp, can live almost anywhere. The cyprinids are omnivorous feeders. Smaller members of this family are important as food fish for larger fish.

Family Percidae - the perch family. This family includes the yellow perch and the walleye, both important economically in commercial and recreational fisheries.

Family Percopsidae - the troutperch. The troutperch live in shoal water of the Great Lakes and some larger inland lakes. They are important as food for gamefish.

Family Salmonidae - the salmon family. The salmon, trout, and whitefish make up this family of fish. The salmonids live in streams and cold water lakes and require higher concentrations of oxygen and lower water temperatures than most families. They are very important economically both in commercial and recreational fisheries.

Family Sciaenidae - the drum family. The freshwater member of the family is the sheephead which inhabits large rivers and lakes. They feed mostly on the bottom, and are generally considered as a coarse fish having little economic value.

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seawall - a structure separating land and water areas primarily designed to prevent erosion and other damage due to wave action.

seiche - a periodic, rapid, and often violent fluctuation or oscillation of the water level of a lake most often caused by winds and barometric pressure. A seiche often occurs after a prolonged period of strong winds from the same direction which causes the water of a lake to pile up on its windswept side. Seiches can cause fluctuations in water levels of up to eight feet which may result in serious flooding of or damage to the adjacent shorelands.

set-up, wind - (1) the vertical rise in the still water level on the leeward side of a body of water caused by wind stresses on the surface of the water; (2) the difference in still water level between the windward and the leeward sides of a body of water caused by wind stresses on the surface of the water.

shoal - a place where water is shallow, sometimes created by a sandbar, in the shipping channels, created by deposition of eroded material.

shore - a strip of land bordering any body of water. A shore of unconsolidated materials is usually called a beach.

shorelands - those lands, waters, and lands beneath the waters in close proximity to the shoreline of the Great Lakes. Included, for the purposes of the study, are uplands extending one-half mile landward of the shoreline and bottom lands and waters extending two miles lakeward of the shoreline.

shorelines - the line forming the intersection of the water with the shore. This line, of course, will vary depending upon the water levels of the Great Lakes.

shoreline protection - structural measures designed for placement along the shore to relieve erosion and flooding damages. Examples of structural measures are protective beaches, seawalls, groins and revetments.

shore type - the character of the shoreland immediately adjacent to the shoreline based upon the physical features of height, composition and erodibility. Shoretypes used in this study are low plain, high bluff, low bluff, high dune, low dune, wetlands, and artificial.

significant wave - a statistical term denoting waves with the average height and period of the one-third highest waves of a given wave group. The composition of the higher waves depends upon the extent to which the lower waves are considered. Experience so far indicates that a careful observer who attempts to establish the character of the higher waves will record values which approximately fit the definition. A wave of significant wave period and significant wave height.

significant wave height - the average height of the one-third highest waves of a given wave group. Note that the composition of the highest waves depends upon the extent to which the lower waves are considered. In wave record analysis, the average height of the highest 1/3 of a selected number of waves, this number being determined by dividing the time of record by the significant period.

significant wave period - an arbitrary period generally taken as the period of the 1/3 highest waves within a given group. Note that the composition of the highest waves depends upon the extent to which the lower waves are considered. In wave record analysis, this is determined as the average period of the most frequently recurring of the larger, well-defined waves in the record under study.

slope - the degree of inclination to the horizontal. Usually expressed as a ratio, such as 1:25 or 1 on 25, indicating 1 unit rise in 25 units of horizontal distance; or in a decimal fraction (0.04); degrees (2° 18'); or percent (4%). It is sometimes described by such adjectives as: steep, moderate, gentle, mild, or flat.

still water level - the elevation of the surface of the water if all wave action were to cease.

successional patterns - orderly process of development that involves predictable changes in species, structure and community processes with time, resulting from modification of the physical development by the community and culminating in a stabilized ecosystem.

topography - the configuration of a surface including its relief, the position of its streams, roads, buildings, etc.

updrift - the direction opposite that of the predominant movement of littoral materials.

uprush - the rush of water up onto the beach following the breaking of a wave.

wave - a ridge, deformation, or undulation of the surface of a liquid.

wave crest - the highest part of a wave. Also that part of the wave above still water level.

wavecrest length - the length of a wave along its crease. Sometimes called crest width.

wave height - the vertical distance between a crest and the preceding trough.

wave length - the horizontal distance between similar points on two successive waves measured perpendicularly to the crest.

wetlands - relatively flat lands that are wet during all or part of the year, being either covered by water or waterlogged. These lands are generally characterized by grasses, shrubs, cattails, bulrushes, and other low growing plants. Along the Great Lakes shoreline, they include marshes, swamps and other lands generally considered to be potential fish and wildlife areas.

wind set-up - (1) the vertical rise in the still water level on the leeward side of a body of water caused by wind stresses on the surface of the water; (2) the difference in still water levels on the windward and the leeward sides of a body of water caused by wind stresses on the surface of the water.

windswept shore - the unprotected shore that receives the full effect of prevailing wind and waves. Thus, the greatest erosion problem areas on the Great Lakes are found along the windswept shore.

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SECTION 111

ENVIRONMENTAL STATEMENT

MITIGATION OF SHORE DAMAGE ATTRIBUTED TO THE FEDERAL NAVIGATION STRUCTURES AT PORT SANILAC HARBOR, MICHIGAN

APPENDIX A

Table A-1
Bottom Sediment Sample Analysis
Michigan Harbors - 1970

FWQA-LHBO

Port Sanilac 6/17

Station No.	Depth (ft.)	Sediment Description: Color	Odor*	Oil	Percent Composition	% Passing No. 10 Mesh Screen
PS 1	9	gray brown with tan layer	Df	no	ooze-100	
PS 2	9	" " " " "	Df	"	ooze-100	98.9
PS 3	10	" " " " "	"	"	ooze-100	
PS 4	10	dk. gray with " "	"	"	ooze-100	98.4
PS 5	11	dk. gray with " "	"	yes	ooze-100	97.8
PS 6	12	" " " " "	"	yes	ooze-80, sand-20	
PS 7	13	" " " " "	"	no	ooze-95, sand-5	99.7
PS 8	14	gray brown with tan layer	"	yes	ooze-55, sand-45	
PS 9	12	dk. gray with tan layer	"	yes	ooze-100	
PS 10	15	dk. gray with tan layer	M,Mm	no	ooze-75, sand-24, stone-1	98.7

Station No.	Depth (ft.)	Solids (percent) Total	Solids (percent) Tot. Vol.	Mercury (mg/kg) Wet B	Mercury (mg/kg) Dry B	Oil & Grease (mg/kg) Wet B	Oil & Grease (mg/kg) Dry B	Total Iron (mg/kg) Wet B	Total Iron (mg/kg) Dry B	Total Phosphorus (mg/kg) Wet B	Total Phosphorus (mg/kg) Dry B
PS 2	9	37.4	7.8	< .2	-	480	1300	9700	26,000	700	1900
PS 4	10	38.6	6.6	< .2	-	500	1300	9900	26,000	700	1800
PS 5	11	47.1	5.4	< .2	-	400	850	9400	20,000	600	1400
PS 7	13	49.2	5.0	< .2	-	530	1100	9000	18,000	700	1400
PS 10	15	33.4	9.0	.2	5.9	700	2100	8400	25,000	660	2000

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Table A-/ (cont'd)
Bottom Sediment Sample Analysis
Michigan Harbors - 1970

FWQA-LHBO

Port Sanilac 6/17 (cont.)

Station No.	Depth (ft.)	Ammonia-Nitrogen (mg/kg)		Organic-Nitrogen (mg/kg)		COD (mg/kg)		Phenol (ug/kg)	
		Wet B	Dry B	Wet B	Dry B	Wet B	Dry B	Wet B	Dry B
PS 2	9	160	430	-	-	30,000	80,000	< 94	-
PS 4	10	160	410	-	-	27,000	70,000	810	2100
PS 5	11	140	300	-	-	27,000	57,000	< 94	-
PS 7	13	110	220	910	1800	26,000	53,000	180	370
PS 10	15	170	510	1100	3300	32,000	96,000	1100	3300

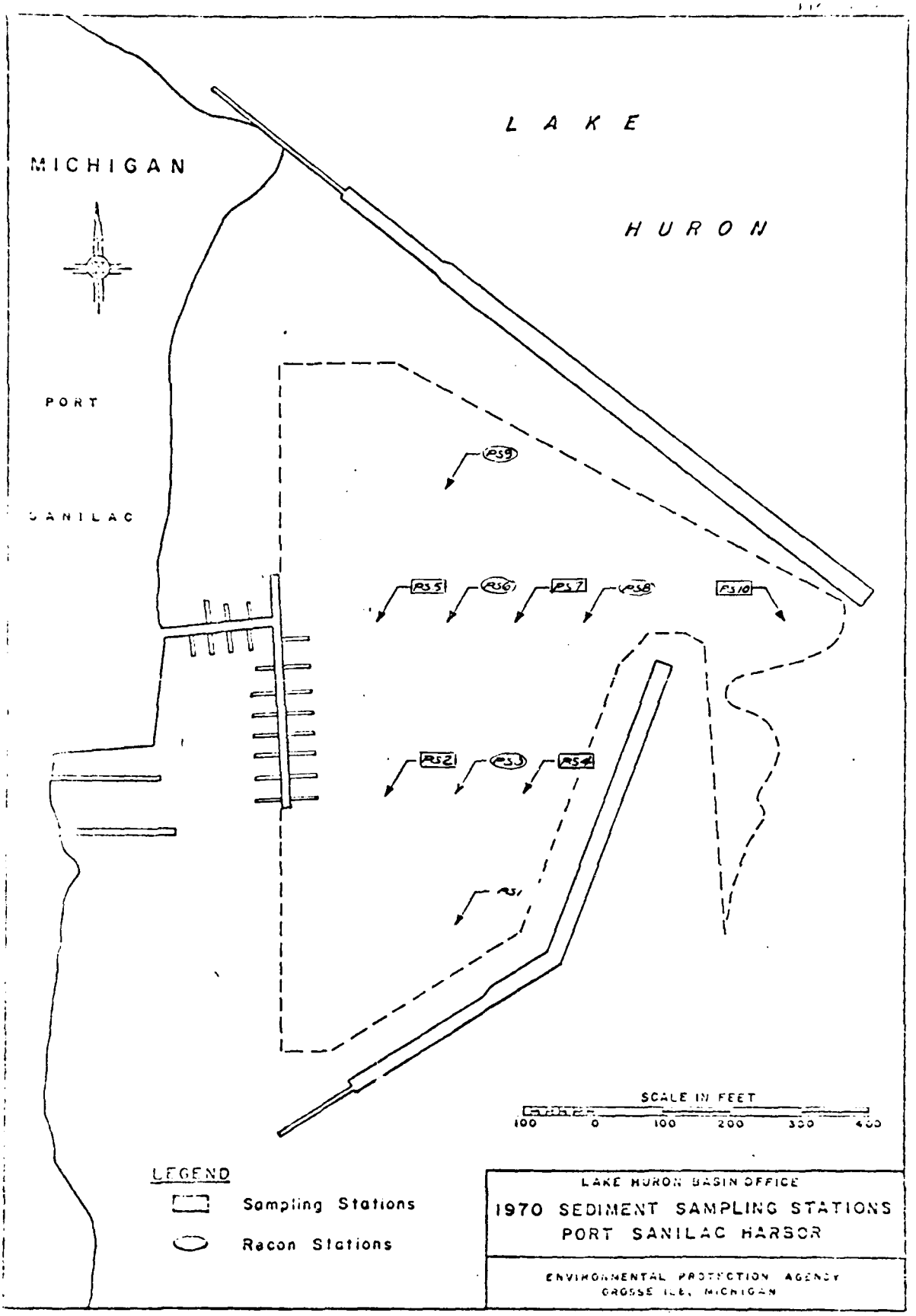
LAKE
MICHIGAN
HURON
PORT
SANILAC
PS9
PS5
PS6
PS7
PS8
PS10
PS2
PS3
PS4
PS1
SCALE IN FEET
100 0 100 200 300 400
LEGEND
Sampling Stations
Recon Stations
LAKE HURON BASIN OFFICE
1970 SEDIMENT SAMPLING STATIONS
PORT SANILAC HARBOR
ENVIRONMENTAL PROTECTION AGENCY
GROSSE ILE, MICHIGAN

TABLE A-1 (cont'd)
SUMMARY OF SEDIMENT QUALITY - 1970

	Project/Location	No. of Samples	No. of Analyses	Pollution Status	General Quality & Remarks
A-4	Port Sanilac	10	90	p	Ooze, sand; high vol. solids, COD, phos; one sample 5.9 mg/kg more ex. More surveillance needed

TABLE A-2
Bottom Sediment Sample Anlaysis
Michigan Harbors - 1972

Port Sanilac May 17

Station No.	Depth (ft.)	Lab. No.	Sediment Description				MIDO-EPA % Passing No. 10 Mesh Screen
			Color	Odor*	Oil	Percent Composition	
PS-02	8	21013	brown-gray	Df,G	no	silt-100	99.7
PS-04	8	21014	brown	G,E	no	ooze-100	99.4
PS-05	10	21010	brown	Df,G	no	silt-100	99.0
PS-07	11	21011	brown-gray	Df,G	no	silt-100	99.7
PS-10	12	21012	brown	E,G	no	pebbles-10, gravel-20 sand-20, silt-50	68.2
PS-11	11	21015	brown	Df	no	pebbles-1, gravel - 1, silt-2 sand-96	98.4
PS-12	11	21016	brown(med)	Df,E	no	sand-100	98.8

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* For description see Appendix B

TABLE 42 (cont.)
Bottom Sediment Sample Analysis
Michigan Harbors - 1972

MIDO-EPA

Port Sanilac - May 17

Station No.	Solids (percent) Total	Solids (percent) Tot. Vol.	COD (mg/kg) Wet B	COD (mg/kg) Dry B	Phenol (ug/kg) Wet B	Phenol (ug/kg) Dry B	Tot. Kjeldahl Nitrogen (mg/kg) Wet B	Tot. Kjeldahl Nitrogen (mg/kg) Dry B	Total Phosphorus (mg/kg) Wet B	Total Phosphorus (mg/kg) Dry B	Oil & Grease (mg/kg) Wet B	Oil & Grease (mg/kg) Dry B
PS-02	51.3	4.4	26,000	51,000	290	560	660	1300	210	410	260	510
PS-04	46.8	5.2	7,000	58,000	<90	-	720	1500	230	490	320	680
PS-05	57.4	3.8	25,000	44,000	100	170	690	1200	200	350	340	590
PS-07	52.6	4.1	26,000	49,000	<90	-	660	1200	200	380	300	570
PS-10	44.1	5.9	31,000	70,000	250	570	800	1800	210	480	310	700
PS-11	76.6	1.0	7,100	9,300	<90	-	180	230	200	260	120	160
PS-12	82.4	0.6	3,600	4,400	<90	-	45	55	160	190	<50	-

A-6

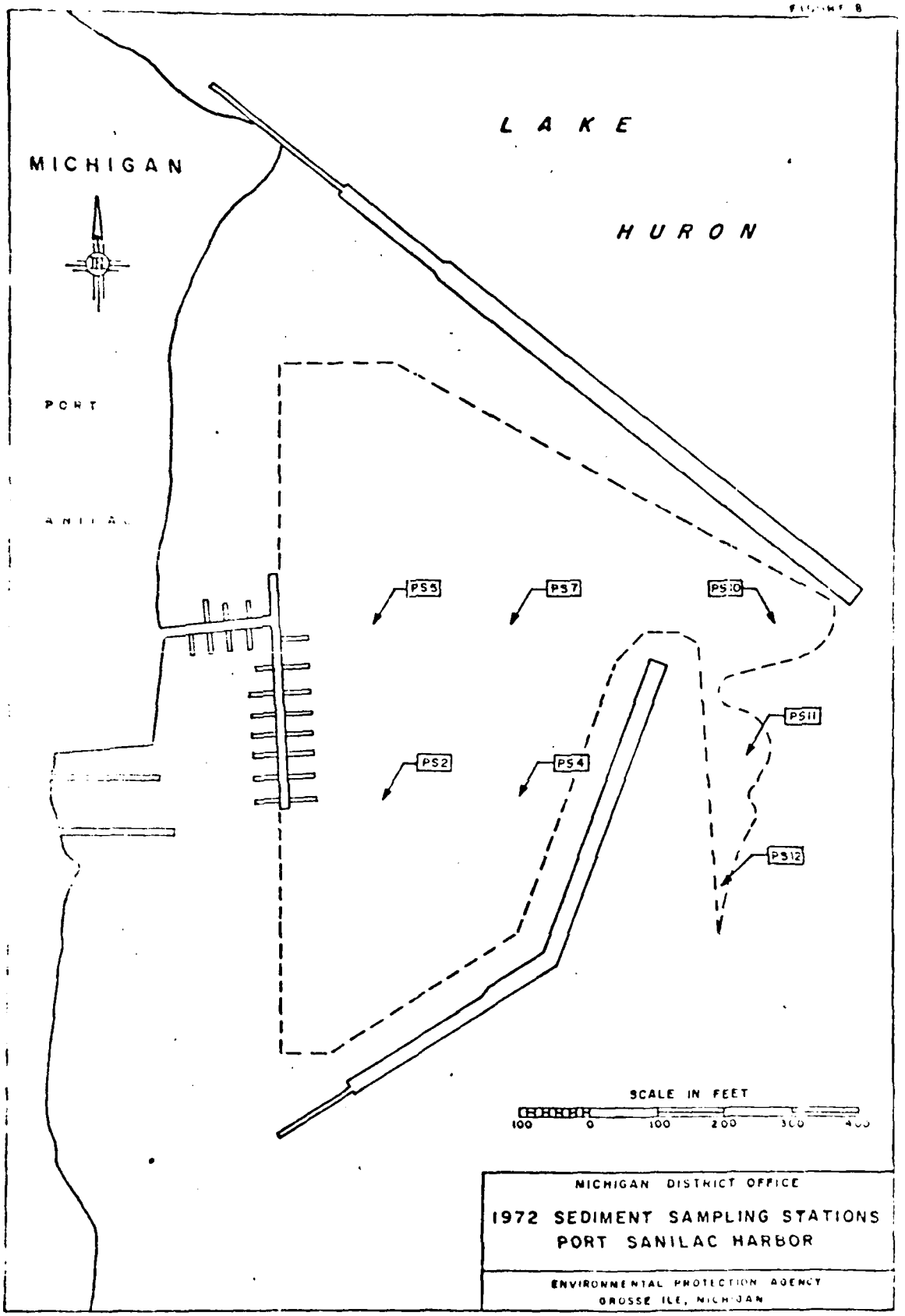

LAKE
MICHIGAN
HURON
PORT
PS5
PS7
PS10
PS11
PS2
PS4
PS12
SCALE IN FEET
100 0 100 200 300 400
MICHIGAN DISTRICT OFFICE
1972 SEDIMENT SAMPLING STATIONS
PORT SANILAC HARBOR
ENVIRONMENTAL PROTECTION AGENCY
GROSSE ILE, MICHIGAN

TABLE A-2 (cont.)
SUMMARY OF SEDIMENT QUALITY 1972

MIDO-EPA

Project/Location	No of Samples	No. of Analyses	Pollution Status	General Quality & Remarks
Harbor area	5	35	p	Silt & ooze, high COD, nitrogen,
Outside harbor entrance	2	14	u**	Clean sand.

PORT SANILAC HARBOR MICHIGAN

SAMPLED: June 4-5, 1974

BY: U.S. Environmental Protection Agency
Region V
Michigan-Ohio District Office
21929 Lorain Road
Fairview Park, Ohio 44126

ANALYSIS BY: Region V Central Regional Laboratory
1819 W. Pershing Road
Chicago, Illinois 60609

REPORT AUTHOR: B. L. Burge
Michigan-Ohio District Office
Fairview Park, Ohio 44126

HARBOR LOCATION: Port Sanilac Harbor is located at Port Sanilac, Michigan which is on the west shore of lower Lake Huron 84 miles north, northeast of Detroit.

ANALYSIS PERFORMED FOR: Harbor Sediment Sampling Program

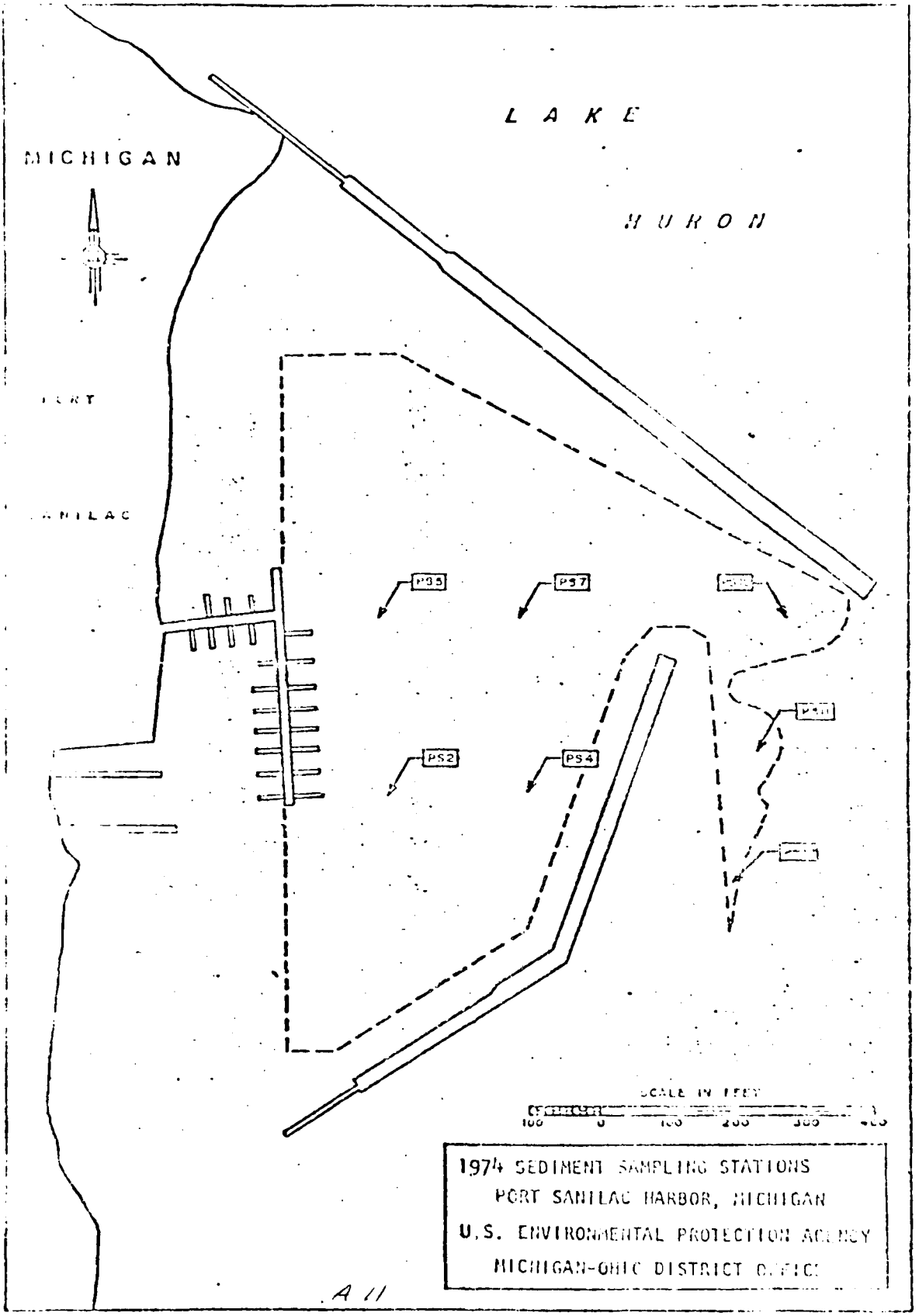
FIELD REPORT

HARBOR: Port Sanilac

STATE: Michigan

SAMPLED: June 4-5, 1974

SAMPLE # STATION	LOCATION	DEPTH FEET	[illegible]
74-[illegible] PS-1	500' S.W. of North end of S. Breakwall 100' inside breakwall	6'	Ekman grab, sediment-tan silt [illegible] color-dark tan, [illegible] twigs, [illegible] ooze, [illegible] clay.
74-[illegible] PS-2	450' W.S.W. of harbor entrance end of breakwall	9'	Ekman grab, sediment-tan silt [illegible] worms, 20% silt, 5% sand [illegible] 60% ooze, 5% clay, 10% leaves, fishy odor
74-[illegible] PS-4	200' due East of PS-2	9'	Ekman grab, 60% ooze, 15% sand 1/25", 20% silt, 5% clay. [illegible] tan, odor fishy, sludgeworms, leaves 10%.
74-[illegible] PS-5	250' North of PS-2	9'	Ekman grab, 30% ooze, 10% sand 1/25", 50% silt, 5% clay. [illegible] tan, fishy odor, sludgeworms leaves 10%.
74-[illegible] PS-7	200' East of PS-5	12'	Ekman grab, 50% ooze, 15% sand 1/25", 15% silt, 5% clay. [illegible] leaves color-dark tan, fishy odor, sludgeworms
74-[illegible] PS-9	250' SW of North Pier 200' North Northeast of PS-5	15'	Ekman grab, 60% ooze, 10% sand 1/25", 5% mud 5% clay, 20% leaves etc, color-tan, odor-fishy, sludgeworms
74-[illegible] PS-10	Middle of Entrance to Harbor	18'	Peterson dredge, sediment-sand
74-[illegible] PS-11	200' due South of PS-10	18'	Peterson dredge - 20% sand 1/25", 75% gravel 1/25"-1", 5% clay, color-tan, no odor
74-[illegible] PS-12	200' due South of PS-11	15'	Peterson dredge, sediment-sand



1974 SEDIMENT SAMPLING STATIONS
PORT SANILAC HARBOR, MICHIGAN
U.S. ENVIRONMENTAL PROTECTION AGENCY
MICHIGAN-OHIO DISTRICT OFFICE

A 11

SEDIMENT EVALUATION

HARBOR: Port Sanilac

STATE: Michigan

SAMPLED: June 4-5, 1974

EVALUATING PARAMETER	MAX. ACCEPTABLE VALUES %	VALUE AT EACH STATION AS A % OF DRY WEIGHT								
		PS-1	PS-2	PS-4	PS-5	PS-7	PS-9	PS-10	PS-11	PS-12
Volatile Solids	6.0	5.84	3.83	7.48	5.55	4.56	4.87	5.76	1.68	2.12
Chemical Oxy. Demand	5.0	8.7	2.9	5.3	5.6	4.4	4.6	4.1	0.77	0.43
Total Kjel. Nitrogen	0.10	0.20	0.075	0.18	0.14	0.12	0.13	0.12	0.013	0.011
Oil-Grease	0.15	0.057	<0.02	<0.02	<0.02	<0.02	<0.02	0.037	<0.02	<0.02
Mercury	0.0001	<0.00002	<0.00002	<0.00003	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Lead	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	0.005	0.0039	0.0074	0.0075	0.0069	0.0067	0.0071	0.0065	0.0028	0.0020
Manganese	None Available	0.0160	0.0330	0.0330	0.0280	0.0190	0.0220	0.0210	0.0140	0.035
Nickel	"	0.0160	0.0180	0.0210	0.0230	0.0160	0.0150	0.0170	0.0130	0.0070
Total Phosphorus	"	0.0260	0.0290	0.0360	0.0340	0.0300	0.0240	0.0330	0.0150	0.0150
Arsenic	"	0.0006	0.0003	0.0004	0.0005	0.0005	0.0005	0.0004	0.0003	0.0001
Barium	"	<0.0060	<0.0060	<0.0060	0.0060	0.0065	0.0070	<0.0060	<0.0060	<0.0060
Cadmium	"	0.00033	0.00051	0.00056	0.00029	0.00025	0.00026	0.00031	0.00015	0.00012
Chromium	"	0.0018	0.0033	0.0035	0.0035	0.0024	0.0031	0.0019	0.0007	0.0014
Cobalt	"	0.0019	0.0022	0.0019	0.0013	0.0026	0.0021	0.0029	0.0006	0.0016
Copper	"	<0.0004	0.0007	0.0005	<0.0004	0.0007	0.0007	0.0013	<0.0003	<0.0003
Iron	"	0.79	1.69	1.78	1.48	1.69	1.63	1.73	0.63	0.39

4/12

PORT SANILAC HARBOR MACROINVERTEBRATES

6/4/74

DIPTERA	PS-1	PS-2	PS-4	PS-5	PS-7	PS-9	PS-10	PS-11	PS-12
Chironomus sp.	4	32	32		32				
Tanytarsus sp.	12	272	64	40	128	16	16	10	12
Tribelos sp.	4		8		8		8		
Cryptochironomus sp.	4			8	8	8	8	3	1
Paralauterborniella sp.	4			8					
Procladius sp.	36	144	256	16	176	40	24		
Paratendipes albimanus		56	16		8		8		
Polypedilum sp				8				3	
Harnischia nais							8		
Harnischia sp.								8	2
Rheotanytarsus sp.								4	19
Cricotopus sp.									1
Psectrocladius sp.									2
EPHEMEROPTERA									
Caenis sp.								12	1
HEMIPTERA									
Sigara lineata			16						
OLIGOCHAETA									
Limnodrilus sp.	104	264	408	136	424	256	124	7	2
Tubifex sp.		16	40	24	24	24			
OTHER									
Cyclops vernalis								3	1

A 13

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V
230 SOUTH DEARBORN STREET
CHICAGO, ILLINOIS 60604

JUL 25 1975

Brigadier General W. O. Bachus
U.S. Army Corps of Engineers
North Central Division
536 South Clark Street
Chicago, Illinois 60605

Dear General Bachus:

Enclosed for your information is our report on the bottom sediment survey conducted at Port Sanilac, Michigan on March 4, 1975.

All sediments at Port Sanilac are suitable for unrestricted open lake disposal.

Further details on this classification and a map showing the location of each zone are included in the report.

As we obtain additional data on Lake Huron harbors, we will send you the necessary information to keep your reports up-to-date.

Sincerely yours,

Christopher M. Timm, Director
Surveillance and Analysis Division

Enclosure

CC: Col. J. Hays, Detroit COE ✓
D. Wallgren, FAB

PORT SANILAC, MICHIGAN

REPORT ON THE DEGREE OF POLLUTION OF BOTTOM SEDIMENTS

1975 HARBOR SEDIMENT SAMPLING PROGRAM

MARCH 4, 1975

U.S. Environmental Protection Agency
Region V
Great Lakes Surveillance Branch

DISCUSSION OF RESULTS

Sediments in Port Sanilac harbor consist of sand with a very substantial silt and clay fraction. The finer particles make up between 45% and 72% of the sediment (Table III).

The harbor has been sampled in June 1970, May 1972, June 1974 and March 1975. The quality of the sediments has improved considerably.

In 1970, the sediments were primarily ooze with dark grey and brown streaks with visible oil at many points. Moderate to high concentrations of volatile solids, COD, and oil and grease were found.

The 1972 survey found less ooze and more silt,sand and gravel. The color had also improved and no oil was visible. Samples in the outer harbor were clean (PS-11 and PS-12). Samples in the inner harbor PS-2,4,5,7 and 10 were still moderately polluted with moderately high values for COD and TKN. oil and grease values were low during the 1972 survey.

The improvement continued in 1974. Four of the seven samples collected in the inner harbor were classified as clean. The remaining three (PS-1, 4, and 5) remained moderately polluted with moderate concentrations of COD, volatile solids and TKN. Oil and grease values were very low. Samples PS-11 and 12 collected outside of the inner harbor confirmed the unpolluted conditions found during 1972. The biological survey done during 1974 found a reasonably diverse benthic community although it was dominated by pollution tolerant organisms. The environment is clearly not toxic to benthos.

The 1975 survey concentrated on the inner harbor and samples were collected closer to the boat docks. Six of the seven samples indicated unpolluted conditions. Volatile solids and COD were low. TKN values were in the moderate range, but this can be attributed to cooler temperatures which slows the utilization of organic nitrogen by organisms. The metal and oil and grease values were uniformly low.

The sample from station PSH 75-7 was moderately polluted with moderate values for COD and zinc and a high value for TKN. The degree of pollution in this one sample is not great and it does not warrent the expense involved in special handling for the sediments in that corner of the harbor.

All sediments in Port Sanilac are acceptable for unrestricted open lake disposal.

TABLE I
FIELD OBSERVATIONS

HARBOR: Port Sanilac, Michigan

SAMPLED: March 4, 1975

STATION NO.	DEPTH (ft.)	OBSERVATIONS				
		COLOR	SAMPLE DESCRIPTION	ODOR	OIL	GENERAL REMARKS
PSH-1	8.6	Dark brown with green streaks	Sand and silt with some organic detritus	None	None	Some worms observed
PSH-2	11.0	Dark brown w/ light brown streaks	Sand and silt	Fishy	None	Some worms observed
PSH-3	7.1	Dark brown	Compacted sand and silt	None	None	Some worms observed
PSH-4	11.2	Dark brown	Sand and silt with some organic detritus	Fishy	None	No organisms observed
PSH-5	7.1	Dark brown	Silt with fine sand, pudding like consistency, some organic detritus.	Fishy	None	Some worms observed
PSH-6	7.1	-	Replicate sample for quality control, same as PSH-5	-	-	
PSH-7	8.0	Dark brown w/ light brown streaks	Mostly silt, pudding like consistency, some organic detritus	None	Yes	Some worms observed

TABLE II
BULK SEDIMENT ANALYSIS RESULTS

HARBOR: Port Sanilac, Michigan

SAMPLED: March 4, 1975

EVALUATION PARAMETER	PSH-1	PSH-2	PSH-3	PSH-4	PSH-5	PSH-6	PSH-7
Volatile Solids %	2.92	4.15	2.99	3.45	3.50	3.47	4.91
Chem. Oxy. Demand	32,000	41,000	32,000	39,000	38,000	37,000	55,000
T. Kjel. Nitrogen	1100	1300	1100	1300	1200	1000	2300
Oil-Grease	500	<400	<400	<400	<400	700	600
Mercury	*	*	*	*	*	*	*
Lead	25	30	25	20	15	25	25
Zinc	72	84	66	68	68	65	92
T. Phosphorous	300	350	320	370	340	320	420
Ammonia Nitrogen	71	81	71	75	100	86	150
Cyanide	0.08	0.05	0.07	0.08	0.48	0.05	0.12
Manganese	295	315	295	345	330	320	450
Nickel	35	45	40	40	30	25	45
Arsenic	7	8	6	4	7	6	7
Barium	20	10	<5	20	25	<5	40
Cadmium	*	*	*	*	*	*	*
Chromium	19	17	17	13	20	15	28
Magnesium	9900	9800	10,000	18,700	16,400	10,300	12,000
Copper	25	32	22	24	23	20	35
Iron	17,100	18,400	16,100	18,100	19,400	17,600	27,200

*Below detection limit.

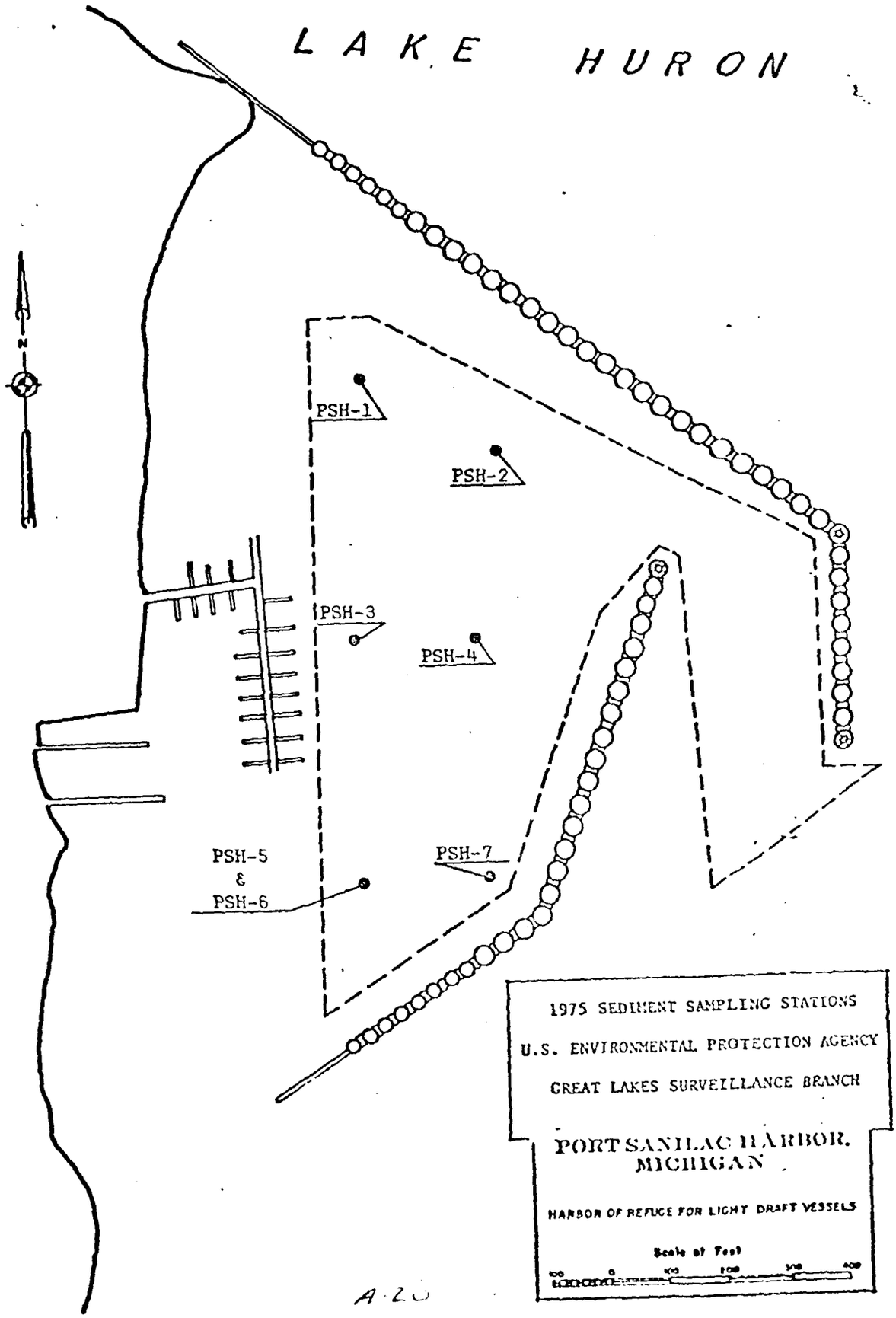
Results in mg/kg dry weight unless otherwize noted.

TABLE III
SIEVE ANALYSIS RESULTS

HARBOR: Port Sanilac, Michigan

SAMPLED: March 4, 1975

SIEVE NO. AND DESCRIPTION	SEDIMENT SIZE ANALYSIS BY PERCENT AT EACH STATION						
	PSH-1	PSH-2	PSH-3	PSH-4	PSH-5	PSH-6	PSH-7
Retained on #10 Medium Gravel and larger	8	5	6	6	8	7	4
Retained on #20 Fine gravel	7 (15)	6 (11)	6 (12)	7 (13)	8 (16)	11 (18)	6 (10)
Retained on #60 Medium and coarse sand	10 (25)	11 (22)	12 (24)	12 (25)	10 (26)	8 (26)	8 (18)
Retained on #200 Fine sand	23 (48)	21 (43)	31 (55)	16 (41)	20 (46)	14 (40)	10 (28)
Passing #200 Silts and clays	52 (100)	57 (100)	45 (100)	59 (100)	54 (100)	60 (100)	72 (100)


LAKE HURON
N
PSH-1
PSH-2
PSH-3
PSH-4
PSH-5
&
PSH-6
PSH-7
1975 SEDIMENT SAMPLING STATIONS
U.S. ENVIRONMENTAL PROTECTION AGENCY
GREAT LAKES SURVEILLANCE BRANCH
PORT SANILAC HARBOR,
MICHIGAN
HARBOR OF REFUGE FOR LIGHT DRAFT VESSELS
Scale of Feet

SECTION 111

ENVIRONMENTAL STATEMENT

MITIGATION OF SHORE DAMAGE ATTRIBUTED TO THE FEDERAL NAVIGATION STRUCTURES AT PORT SANILAC HARBOR, MICHIGAN

APPENDIX B

IMPACT OF ALTERNATIVE SOLUTIONS

TABLE B-1

IMPACT OF ALTERNATIVE SOLUTIONS
FOR
PORT SANILAC, MICHIGAN SECTION 111 PROJECT

Description	National Economic Development	Environmental Quality	Social Well-Being	Regional Development
1. Do nothing (Erosion caused by navigation structures continues)	Continued economic decline	a. Physical loss of land b. Unstable littoral environment c. Turbid condition of lake would continue d. Detrimental to aesthetics	a. Recreational fishery off breakwaters would remain b. Structural property damage c. Loss of land d. Loss of buildings which cannot be economically moved	Continued economic decline
2. Remove navigation structures	Negative impact on local development	a. Restore littoral drift and improve environmental quality of shore damage area b. Reduce loss of land c. Improve littoral environment d. Eliminate turbid condition of lake e. Improve fish and wildlife habitat in general f. Decrease in maintenance costs of existing shore protective structures and obviate the need for installation of new structures	a. Negative impact on community development b. Increased unemployment c. General decline in economic well-being d. Loss of recreation afforded pleasure craft using harbor e. Loss of beach north of harbor (resulting loss of structures built on area of accretion)	a. Negative impact on regional development - b. Curtailment of trade c. Loss of capital investment in harbor facilities and industry dependent upon them d. Loss of employment

TABLE B-1 (Cont'd)

IMPACT OF ALTERNATIVE SOLUTIONS
FOR
PORT SANILAC, MICHIGAN SECTION 111 PROJECT

Description	National Economic Development	Environmental Quality	Social Well-Being	Regional Development
3. Shoreland regulation (Limiting unwise development in high-risk erosion areas through zoning, building codes, sub-division regulation, etc.). Evacuation - (Moving homes in jeopardy).	Prevents losses to potential future development	Preserve ecologically unique areas from encroachment	a. Restricts individual freedom of land use b. Reduces potential suffering and hazard	Prevents losses to potential future shoreline development
4. Partial removal of navigation structures reduction of project depth, and shoreline management	a. Negative impact on local development	a. Partially restore littoral drift and improve environmental quality b. Reduce loss of land c. Partially improve littoral environment d. Partially eliminate turbid condition of lake e. Somewhat improve fish and wildlife habitat f. Preserve ecologically unique areas from encroachment	a. Negative impact on community development b. Increased unemployment c. General decline in economic well-being d. Reduces potential suffering and hazard e. Reduction in recreation afforded by pier fishing f. Increased wave action within harbor would reduce or eliminate recreational boating	a. Negative impact on l development b. Curtailment of trade c. Loss of capital investment in harbor facilities and industry dependent upon them d. Loss of employment e. Prevents losses to potential future sho line developments

TABLE B-1 (Cont'd)

IMPACT OF ALTERNATIVE SOLUTIONS
FOR
PORT SANILAC, MICHIGAN SECTION 111 PROJECT

Description	National Economic Development	Environmental Quality	Social Well-Being	Regional Development
*5. Continuous armor protection (Bulkheads, seawalls, revetments) with reshaping of bluff to stable angle of repose. Seed and sod.	Prevent future damage	a. Eliminate loss of land b. Reduce turbid condition of lake c. Cause scour and loss of material from in front of walls d. Cause erosion problem to move downdrift so that eventually a continuous belt of armor protection would be required e. Aesthetically displeasing f. Decrease in maintenance costs of existing shore protective structures and obviate the need for installation of new structures	a. Some homes would be moved and property lost with bluff shaping b. Loss of recreation beaches c. Loss of access to the lakes d. Structural property damage would cease	Prevent future damage

TABLE B-1 (Cont'd)

IMPACT OF ALTERNATIVE SOLUTIONS
FOR
PORT SANILAC, MICHIGAN SECTION 111 PROJECT

Description	National Economic Development	Environmental Quality	Social Well-Being	Regional Development
. Groins	Continued economic decline because littoral supply insufficient to fill groins and eliminate future damage	a. Physical loss of land b. Unstable littoral environment c. Turbid condition of lake would continue d. Cause erosion problem to move downdrift so that eventually additional protection would be required e. Detrimental to aesthetics f. Decrease in maintenance costs of existing shore protective structures	a. Structural property damage b. Loss of recreation beaches c. Loss of building which cannot be economically moved	Continued economic decline
7. Groins artificially filled (annual nourishment)	Prevent future damage	a. Eliminate loss of land b. Eliminate turbid condition of lake c. Aesthetically displeasing d. If lake borrow is used for initial construction and/or annual nourishment, a temporarily turbid condition in lake borrow area and area of placement would be created e. Land borrow would impact on the source site to the degree associated with the removal of 90,000 cubic yards and subsequent periodic removal of 30,000 cubic yards of sand, and could create a temporary turbid condition in the area of placement.	a. Structural property damage would cease b. Artificial creation of bathing beaches c. Loss of land would cease	Prevent future damage

TABLE B-1 (Cont'd)

IMPACT OF ALTERNATIVE SOLUTIONS
FOR
PORT SANILAC, MICHIGAN SECTION 111 PROJECT

Description	National Economic Development	Environmental Quality	Social Well-Being	Regional Development
2. (Continued)		f. Decrease in maintenance costs of existing shore protective structures and obviate the need for installation of new structures		

TABLE B-1 (Cont'd)

IMPACT OF ALTERNATIVE SOLUTIONS
FOR
PORT SANILAC, MICHIGAN SECTION 111 PROJECT

Description	National Economic Development	Environmental Quality	Social Well-Being	Regional Development
*8. Offshore breakwaters	Eventual prevention of damage	a. Physical loss of land would continue at a decreased rate b. Unstable littoral environment c. Turbid condition of lake would eventually diminish d. Aesthetically displeasing e. Decrease in maintenance costs of existing shore protective structures and obviate the need for installation of new structures f. Potentially act as fish attractors g. Could result in loss of lake bottom	a. Structural property damage would slowly decrease b. Eventual creation of artificial bathing beaches c. Loss of land would slowly decrease d. Hazard to navigation	Economic decline would continue but at a slower rate until eventually eliminated
*9. Offshore breakwaters and annual beach nourishment	(All of 8, but would eliminate damage and negative impacts quicker.)			

TABLE B-1 (Cont'd)

IMPACT OF ALTERNATIVE SOLUTIONS
FOR
PORT SANILAC, MICHIGAN SECTION 111 PROJECT

	Description	National Economic Development	Environmental Quality	Social Well-Being	Regional Development
*10.	Protective beaches (Restore littoral drift) and annual replenishment	Mitigate future shore damage caused by piers without eliminating natural erosion	a. Future loss of land attributable to the navigation project would be mitigated b. Littoral environment would be stabilized c. Aesthetically pleasing d. If lake borrow is used for initial construction and/or annual nourishment, would create a temporarily turbid condition in lake borrow area and area of placement e. If land borrow is used, would impact on the source site to the degree associated with the initial removal of 90,000 cubic yards and subsequent periodic removal of 30,000 cubic yards of sand, and would create a temporary turbid condition in the area of placement. f. Decrease in maintenance costs of existing shore structures and obviate the need for installation of new structures g. Will not disturb perch spawning area known to exist adjacent to the north and south piers h. Area under eroding bluffs will become more accessible to shore fishermen	a. Damage and loss of land attributable to navigation project would be mitigated B. Eventual creation of artificial bathing beaches	Economic decline attributable to Federal navigation project would be mitigated

*The primary objective of developing a Section 111 Project at Port Sanilac would be to restore that part of the littoral drift which is being interrupted by the navigation project. The authority is not intended to provide mitigation measures of such magnitude as to approach the extent of protection usually associated with the development of regular beach erosion control projects. Therefore, alternative solutions 5-9 would be beyond the authority of Section 111.

SECTION 111

ENVIRONMENTAL STATEMENT

MITIGATION OF SHORE DAMAGE ATTRIBUTED TO THE FEDERAL NAVIGATION STRUCTURES AT PORT SANILAC HARBOR, MICHIGAN

APPENDIX C

PERTINENT CORRESPONDENCE

STATE OF MICHIGAN

WILLIAM G. MILLIKEN, Governor

DEPARTMENT OF NATURAL RESOURCES

STEVENS T. MASON BUILDING, LANSING, MICHIGAN 48926

RALPH A. MAC MULLAN, Director

September 11, 1970

Colonel Myron D. Snoke, District Engineer
Detroit District, Corps of Engineers
U. S. Department of the Army
P. O. Box 1027
Detroit, Michigan 48231

Dear Colonel Snoke:

Reference is made to your letter of September 3 concerning the need for a study of littoral shore processes in the vicinity of Port Sanilac. We are familiar with the provisions of Section 111 of the Rivers and Harbors Act of 1968 (P.L. 90-483), and wish to concur with your position with regard to this study.

We endorse such action on the part of the Detroit District to proceed to make such determinations as provided for under Section 111 and to take such other action as is necessary to correct the problem of disposition of littoral materials which are closing the northerly side of the Port Sanilac Harbor, and, in fact, are occupying substantial increased portions of the inner harbor of this breakwater system.

We would urge that this project be given your immediate attention as soon as funds can be made available from higher echelons for these purposes.

Sincerely,

Ralph A. Mac Mullan

Ralph A. Mac Mullan
Director

cc: Mr. C. J. Rapp

MICHIGAN
THE GREAT LAKE STATE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V
230 SOUTH DEARBORN STREET
CHICAGO, ILLINOIS 60604

JUL 25 1975

Brigadier General W. O. Bachus
U.S. Army Corps of Engineers
North Central Division
536 South Clark Street
Chicago, Illinois 60605

Dear General Bachus:

Enclosed for your information is our report on the bottom sediment survey conducted at Port Sanilac, Michigan on March 4, 1975.

All sediments at Port Sanilac are suitable for unrestricted open lake disposal.

Further details on this classification and a map showing the location of each zone are included in the report.

As we obtain additional data on Lake Huron harbors, we will send you the necessary information to keep your reports up-to-date.

Sincerely yours,

Christopher M. Timm, Director
Surveillance and Analysis Division

Enclosure

CC: Col. J. Hays, Detroit COE ✓
D. Wallgren, FAB

STATE OF MICHIGAN

NATURAL RESOURCES COMMISSION

[illegible] JOHNSON
[illegible] M. LAITALA
[illegible] JEAN PRIDGEON
[illegible] HEARTY P. SNELL
[illegible] HARRY H. WHITELEY
[illegible] JANE L. WOLFE
[illegible] CHARLES G. YOUNGLOVE

WILLIAM G. MILLIKEN, Governor

DEPARTMENT OF NATURAL RESOURCES

STEVENS T. MASON BUILDING, LANSING, MICHIGAN 48926
HOWARD A. TANNER, Director

Refer to:
5500

September 12, 1975

Mr. Jerome J. Doline
Department of the Army
Detroit District, Corps of Engineers
P.O. Box 1027
Detroit, Michigan 48231

Dear Mr. Doline:

In reference to your telephone call last week, and per your request, I have enclosed copies of the commercial harvest and creel census compilations for all of Lake Huron.

In our discussion, if you will recall, we discussed dredging times for the Great Lakes ports. If you don't mind, I would like to reiterate to the schedule I provided you some time ago. One point I particularly wish to clarify - and one which we thoroughly discussed with the Corps dredging and maintenance people last fall - is that our list should be interpreted to mean that dredging should be done on or prior to those dates listed.

If you still have questions regarding this schedule, please don't hesitate to call me or Mr. Dale Granger of our Hydrological Survey Division.

Sincerely,

Ned E. Fogle
Great Lakes Specialist
FISHERIES DIVISION

NEF:bm
Enclosures

cc - Dale Granger

MICHIGAN
THE GREAT LAKES STATE

[illegible] 1-75

1974 - LAKE [illegible]
TOTAL LANDINGS
ALL GEAR
(SUMMARY)

MONTH	EFFORT	WHITE FISH	MENOM-INEE	PERCH	CARP	CAT-FISH	BULL-HEADS	ROCK-BASS	CRAP-PIES
JANUARY				5832	4241		95		
FEBRUARY				4807	6346		40		
MARCH				17,142	3274		1675		
APRIL		18	1	18761	8496	41946	6686		316
MAY	Brown 8 Rainbow 4	57,741	9	24,430	122210	67,033	12805	227	316
JUNE	Brown 3 Rainbow 5	36,713		9,351	125,358	39,102	1457		546
SUB-TOTAL JAN - JUN	Brown 11 Rainbow 9	16,485	10	159901	376396	148097	15610	227	1178
JULY		42,581	65	8248	36078	43,056	1839		3515
AUGUST	Brown - 24 Coho - 2	25 090		4667	48752	36,359	1276		4300
SEPTEMBER	Salmon 13 Lake Trout 4	33195	20	4756	76,561	18,144	3346		224
OCTOBER Rainbow 3 Brown 17	Salmon - 5 Lake Trout - 2	47,598		14,591	122,893	23782	8453		2,046
NOVEMBER		147		22,584	35,865	5261	7754		662
DECEMBER				15,240	4323	710	696		172
SUB-TOTAL JUL - DEC PB-3	Brn 41 Coho 13 Salmon 17 Lake Trout 6	170620	85	70086	324472	137512	23346		16,919
TOTAL JAN - DEC	Brn 52 Rainbows 12 Coho 2 Salmon 17 Lake Trout 6	267,105	95	229,987	700,867	274,591	38,178	227	18,097

1974 MICHIGAN SPORT FISHING SURVEY*JAN 1-DEC 31 *ALL FISHING

CATCH ON LAKE HURON AND ITS TRIBUTARY STREAMS

LOCATION	LAKE TROUT	RAINBOW/ STEELHD	BROWN TROUT	BROOK TROUT	COHO SALMON	CHINOOK SALMON	WALLEYE/ SAUGER	BASS	N. PIKE/ MUSKY	YELLOW PERCH
LAKE HURON (OPEN WATER)	18540	87660	104220	0	34740	195660	22500	65160	104580	2729880
SAGINAW BAY	0	6840	540	0	1440	5220	7380	74160	47520	13233060
LAKE GEORGE	0	0	0	0	0	0	0	0	0	0
MUNUSCONG BAY	0	180	0	0	0	180	91260	2160	22320	123300
LAKE NICOLET	0	0	0	0	0	0	180	0	0	14040
POTAGANNISSING BAY	0	0	0	0	0	0	1260	2520	9720	59040
ST. MARYS RIVER	540	4320	0	0	360	0	14220	9180	34380	298440
AU GRES RIVER (WHITNEY DRAIN)	0	21600	0	0	1620	19080	0	0	0	0
AU SABLE RIVER	0	50940	0	0	13500	45360	0	0	0	0
BLACK RIVER	0	5040	0	0	0	720	0	0	0	0
CARP RIVER	0	7200	0	0	360	0	0	0	0	0
CASS RIVER	0	0	0	0	1620	1260	0	0	0	0
CHEBOYGAN RIVER	0	7380	0	0	540	5400	0	0	0	0
OCQUEOC RIVER	0	8280	0	0	5760	34560	0	0	0	0
PINE RIVER	0	0	0	0	0	0	0	0	0	0
PINE RIVER (MACKINAC COUNTY)	0	720	0	0	0	720	0	0	0	0
RIFLE RIVER	0	3600	0	0	180	1980	0	0	0	0
TAWAS RIVER	0	3420	0	0	1620	1260	0	0	0	0
THUNDER BAY RIVER	0	5400	0	0	4140	10080	0	0	0	0
TROUT RIVER	0	360	0	0	0	1080	0	0	0	0
OTHER	0	3780	0	0	0	1620	0	0	0	0
T O T A L	19080	216720	104760	0	65880	324180	136800	153180	218520	16457760

CATCH ON LAKE HURON AND ITS TRIBUTARY STREAMS

LOCATION	SUNFISH/ BLUEGILL	CRAPPIE/ WH. BASS	BULLHEAD/ CATFISH	ROCK BASS	WHITEFISH/ SUCKER	CISCO	OTHER	ANGLER DAYS	FISHERMEN
LAKE HURON (OPEN WATER)	236700	50220	136620	0	91980	40680	115200	1170000	209340
SAGINAW BAY	593640	225540	576180	0	60480	540	43380	1193220	206460
LAKE GEORGE	0	0	0	0	0	0	0	0	0
MUNUSCONG BAY	20700	5760	101340	0	1440	0	180	80640	13860
LAKE NICOLET	1080	0	0	0	0	0	0	1440	720
POTAGANNISSING BAY	16380	0	900	0	0	540	0	14400	3240
ST. MARYS RIVER	42480	4500	41760	0	3780	26280	900	106560	13500
AU GRES RIVER (WHITNEY DRAIN)	0	0	0	0	0	0	720	75240	14220
AU SABLE RIVER	0	0	0	0	0	0	1980	169650	40690
BLACK RIVER	0	0	0	0	0	0	0	8280	2520
CARP RIVER	0	0	0	0	0	0	0	14400	3240
CASS RIVER	0	0	0	0	0	0	0	19800	3600
CHEBOYGAN RIVER	0	0	0	0	0	0	0	26100	3240
OCQUEOC RIVER	0	0	0	0	0	0	0	31140	6120
PINE RIVER	0	0	0	0	0	0	0	180	180
PINE RIVER (MACKINAC COUNTY)	0	0	0	0	0	0	0	2700	540
RIFLE RIVER	0	0	0	0	0	0	0	16200	2700
TAWAS RIVER	0	0	0	0	0	0	0	7560	3240
THUNDER BAY RIVER	0	0	0	0	0	0	0	23940	5760
TROUT RIVER	0	0	0	0	0	0	0	7740	900
OTHER	0	0	0	0	0	0	540	8820	2340
T O T A L	910980	286020	856800	0	157680	68040	162900	2977020	

Page C-5

FRANK L. GROAT
Realtor
83 S. ...idge Street
Port Sanilac, Michigan 48469
Phone-622-9931

Lake Front Homes & Frontage
Farms-Large & Small
Retirement Homes
Business Opportunities

June 6, 1975.

Mr. Phil-ip McCallister,
Chief of Design,
U.S.Corp of Engineers
P.O.Box 1027
Detroit, Michigan 48231
Dear Mr. McCallister:

In a current issue of the Port Huron Times Herald there appeared an item concerning a "Feeder Beach" between the Harbor at Port Sanilac and Washington Road - two miles to the South.

Besides being in the Real Estate business I own property in this area and am very much interested. If you have a plan, is it possible for me to obtain a copy? I would be interested in any pertinent information.

Thanking you in advance, I am,

Sincerely,
Frank Groat.

FG/g

Rec'd
10 JUN 1975

PAUL E. SIEGERT
11677 LAKEPOINTE
DETROIT, MICHIGAN 48224

June 18, 1975

Mr. Philip McCallister
U. S. Army Corps of Engineers
P. O. Box 1027
Detroit, Michigan 48231

Dear Mr. Mc Callister:

I have just learned of the proposed feeder beach along the two miles of Huron shore south of Port Sanilac, Michigan.

Since I am a lake shore property owner in this area, I can speak with some authority as to the damage the Port Sanilac Harbor has done to my shore line. It has cost me about 7000.00 to protect my land. In spite of this cost, my frontage beach does not have the sand it once had.

I realize that the boating enthusiasts need a safe harbor for protection in bad weather. However, it is very hard for me to become reconciled to the high cost this project has imposed on me. I would appreciate any plan that would bring back the sandy conditions that once existed here.

Sincerely yours,
Paul E. Siegert
Paul E. Siegert

Rec'd
18 JUN 1975

ALFRED E. SIEGERT
11604 ROSSITER
DETROIT, MICH 48224
JUNE 19, 1975

U. S Army Corps of Engineers

Gentlemen:

I recently read in a Port Huron paper that you are proposing construction of a feeder beach from Fort Gratiot to a point 2 miles to the south.

I am a lakeshore property owner in this area and would be much in favor of such an undertaking.

Since the Fort Gratiot harbor was constructed, we have lost all our beach sand.

The high lake level and wave action in 1972 & 73 have eroded our land to such an extent that we were forced to go to a considerable expenditure for the construction of a steel piling sea wall and back-fill to save our building.

With the present extending of the Port Gratiot break water, we are concerned that as time goes on, we may lose the steel piling and consequently our building. For these reasons, we are in favor of anything that can be done to alleviate further erosion.

We hope you have success with your proposed plans.

Very truly yours,
Alfred E. Siegert

23 JUN 1975

511 South Lake Street
Port Sanilac, Michigan
June 21, 1975

U.S. Army Corps of Engineers
Environmental Branch
P.O. Box 1027

Dear Sirs

With reference to beach erosion south of Port Sanilac, Michigan we urgently request that all possible speed and consideration be given to the proposed construction of a feeder beach between Port Sanilac and Washington Road. As you well know the beaches south of the Sanilac Harbor have suffered greatly since theharbor was built and our very expensive break walls are again in danger of wash out due to thecontinued backeddies.To help keep this from again becomming another disaster area we request your continued consideration.

Respectfully

Milton F. Schreiber

C-9

Recd
8 8 JUN 1975

525 S Lake St
Port Sanilac,
Michigan
[illegible]

U. S. Army Corps of Engineers
Environmental Branch
P.O Box 1027
Detroit, Mich 48231

Dear Sirs

With reference to beach erosion north of Pt. Sanilac, Michigan we urgently request that something be done to alleviate the shoreline erosion south of the harbor we have lost at least 100 feet of lakefront including a sandy beach which we had for years before construction of the harbor at Pt. Sanilac. We are very much afraid that the extension of the north wall of the harbor will endanger the expensive breakwall we had to install at our own expense.

We request that all possible speed and consideration be given to the proposed construction of a jetty between Pt. Sanilac and Washington road to help keep this from again becoming another disaster area

Respectfully yours
Sam and Ruth Sanilac

RECEIVED
26 JUN 1975

C-1c

275 South Lake St.
Port Sanilac, Mich 48469
July 10, 1975

U.S. Army Corp of Engineers
Environmental Branch
P.O. Box 1027, Detroit Mich 48231

Dear Sir

According to the Port Huron Times Herald you invited people to write in and express their thoughts pertaining to beach erosion in our area.

We have the frontage property in the village, located about ½ mile south of the pier. Fortunately quite a few of the property owners in our area have jetties, a number of them have been repaired or replaced during the past few years. There is very little or no erosion taking place along this area. There is a jetty, that is in need of repair, but I am unable to do so because of high costs.

I remember from the stories of old timers that in the early days the Port Sanilac shoreline was considered the most dangerous

is damaged, caused by the construction of the Harbor the Government would bear the expense of repair. There has been a lot of damage and erosion and the property owners have to meet the cost of installations of seawalls and jetties with little or no assistance from the government.

I heartily agree with the idea of building up a sandbar some distance out in the lake and then the building of jetties, either with stone cribs, stone filled baskets, sand tubes etc. either one or both could be effective if they are close enough together - 40 feet to 60 feet apart.

Thank you for letting me respond.

Sincerely

John A. Fitch

Read
15 JUL 1975

FINAL ENVIRONMENTAL STATEMENT

MITIGATION OF SHORE DAMAGE ATTRIBUTED TO THE FEDERAL NAVIGATION STRUCTURES AT PORT SANILAC, MICHIGAN

APPENDIX D

RESPONSE TO
DRAFT ENVIRONMENTAL
IMPACT STATEMENT

FEDERAL POWER COMMISSION
REGIONAL OFFICE
31st Floor, Federal Building
230 South Dearborn Street
Chicago, Illinois 60604

June 11, 1975

Colonel James E. Hays
District Engineer
U. S. Army Engineer District, Detroit
P. O. Box 1027
Detroit, Michigan 48231

Attention: Environmental Resources Branch

Dear Colonel Hays:

We have reviewed the Draft Environmental Statement dated May 1975 for proposed mitigation of shore damage attributable to the Federal navigation structures at Port Sanilac Harbor, Michigan, furnished with a letter dated May 28, 1975 from Mr. P. McCallister, Chief, Engineering Division. Our comments are requested.

Comments of this office are made in accordance with the National Environmental Act of 1969 and the August 1, 1973 Guidelines of the Council on Environmental Quality. Our principal concern with developments affecting land and water resources is the possible effect of such developments on bulk and electric power facilities including potential hydroelectric developments and on natural gas pipeline facilities.

Since the above noted proposed project apparently would pose no major obstacle to the construction and operation of such facilities, we have no comments on the Draft EIS.

The foregoing statements are of this office and therefore do not necessarily represent the views of the Federal Power Commission itself.

Thank you for the opportunity to comment on the Draft Environmental Statement.

Sincerely yours,

Lenard B. Young
Regional Engineer

By Orville E. Hinkebein
Acting

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
NORTHEASTERN AREA STATE AND PRIVATE FORESTRY
6816 MARKET STREET UPPER DARBY PA 19082
TELEPHONE 215/596-1670

8400
July 15, 1975

P. McCallister, Chief
U.S. Army Engineer District, Detroit
ATTN: Environmental Resources Branch
P.O. Box 1027
Detroit, Michigan 48231

Refer to: NCEED-ER

Dear Col. McCallister:

We have reviewed the Draft Environmental Statement on Mitigation of Shore Damage Attributed to the Federal Navigation Structures at Port Sanilac, Michigan.

Since the greater part of the activity described will occur in the harbor, we anticipate no major effect on forests or other vegetation.

Thank you for the opportunity to review and comment on the draft.

Sincerely,

DALE O. VANDENBURG
Staff Director
Environmental Quality Evaluation

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE Room 101, 1405 South Harrison Road
East Lansing, Michigan 48823

June 24, 1975

U.S. Army Engineer District, Detroit
ATTN: Environmental Resources Branch
P.O. Box 1027
Detroit, Michigan 48231

Gentlemen:

The draft environmental impact statement for the proposed creation of an initial protective beach and subsequent feeder beach to be located in the vicinity of Port Sanilac Harbor, Sanilac County, Michigan, was received by this office for review and comment.

We offer the following suggestion:

> In Section 1.46, Post-Construction Clean-up or Obliteration, it is stated that temporary facilities will be obliterated and "the area will be restored to near natural conditions which will permit the growth of vegetation thereon." In other sections of the Draft Environmental Statement, it is implied that these areas will be planted to trees and other vegetation. However, this is not clearly stated. Therefore, we suggest Section 1.46 be expanded to state that "temporary facilities such as haul roads, work areas, structures, stockpiles of excess or waste materials, or other vestiges of construction will be obliterated and the areas restored to near natural conditions. These areas will be vegetated with trees and grasses as directed by the Contracting Officer as a part of the overall project.

We appreciate the opportunity to review and comment on this proposed project.

Sincerely yours,

Rodney H. Harner
acting
Arthur H. Cratty
State Conservationist

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

Address reply to:
COMMANDER (mep)
Ninth Coast Guard District
1240 East 9th St.
Cleveland, Ohio 44199
Phone: 216-522-3919

5922
21 July 1975

Department of the Army
Detroit District, Corps of Engineers
P. O. Box 1027
Detroit, Mic higan 48231

Attn: Mr. Clarke Dilks, Biologist

Re: Draft Environmental Impact Statement, for Port Sanilac Harbor Beach Improvement; Sanilac County, Michigan

Dear Mr. Dilks:

The above referenced Draft Environmental Impact Statement has been reviewed by this office and at this time we have no comment to offer.

Sincerely,

W. C. OCHMAN
Captain, U.S. Coast Guard
Chief, Marine Safety Division
By direction of the Commander,
Ninth Coast Guard District

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS
U S COAST GUARD (G-WS 73)
400 SEVENTH STREET SW
WASHINGTON D C 20590
PHONE (202) 426-2262

18 JUL 1975

Mr. P. McCallister
Chief, Engineering Division
Department of the Army
Detroit District, Corps of Engineers
P. O. Box 1027
Detroit, Michigan 48231

Dear Mr. McCallister:

This is in response to your letter of 23 May 1975 addressed to Commandant, U. S. Coast Guard concerning a draft environmental impact statement for Port Sanilac Harbor, Sanilac County, Michigan.

The Department of Transportation has reviewed the material submitted. We have no comments to offer nor do we have any objection to this project.

The opportunity to review this draft statement is appreciated.

Sincerely,

D. J. RILEY
Captain, U. S. Coast Guard
Deputy Chief, Office of Marine Environment
and Systems
By direction of the Commandant

Advisory Council
On Historic Preservation
1522 K Street N.W.
Washington, D.C. 20005

August 13, 1975

Mr. F. McCallister
Chief, Engineering Division
Detroit District
Corps of Engineers
U.S. Department of the Army
P.O. Box 1027
Detroit, Michigan 48231

Dear Mr. McCallister:

This is in response to your request of May 28, 1975 for comments on the draft environmental statement for the mitigation of shore damage at Port Sanilac Harbor, Michigan. Pursuant to its responsibilities under Section 102(2)(C) of the National Environmental Policy Act of 1969, the Advisory Council on Historic Preservation has determined that your draft environmental statement appears procedurally adequate. However, we have the following substantive comments to make:

> To insure a comprehensive review of historical, cultural, archeological, and architectural resources, the Advisory Council suggests that the final environmental statement contain evidence of contact with the appropriate State Historic Preservation Officer and that a copy of his comments concerning the effects of the undertaking upon these resources be included in the statement. The State Historic Preservation Officer for Michigan is Dr. Martha Bigelow, Director, Michigan History Division, Department of State, Lansing, Michigan 48918.

Your cooperation in this matter is appreciated.

Sincerely yours,

Myra F. Harrison

John D. McDermott for The D
Director, Office of Review
and Compliance

D-6

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V
230 SOUTH DEARBORN ST
CHICAGO, ILLINOIS 60604

JUN 16 1975

Mr. P. McCallister
Chief, Engineering Division
U. S. Army Engineer District, Detroit
P. O. Box 1027
Detroit, Michigan 48231

Dear Mr. McCallister:

We have completed our review of the Draft Environmental Impact Statement (EIS) for Mitigation of Shore Damage Attributed to the Federal Navigation Structures at Port Sanilac Harbor, Sanilac County, Michigan as requested in your letter of May 23, 1975. In general, the EIS adequately describes the proposed project and with some exceptions its potential environmental impacts. We do, however, have some comments to make which should be addressed in the Final EIS. As you know, our agency has had considerable involvement in the project area. We have commented on the EIS for Breakwater Extensions at Port Sanilac and the EIS for the proposed Lexington Harbor of Refuge (11 miles south of Port Sanilac). We note that the former project has been delayed because of material delays.

Since this proposal constitutes a Section 404 action, Section 404(b) guidelines should be considered in implementing the proposal. Since it has been assured in the EIS that the proposed fill material for beach formation and nourishment measures will be clean, unpolluted sand, analysis of the fill's chemical composition would not be necessary. However, a qualitative statement should be provided in the Final EIS that the fill material will not exceed EPA's bottom sediment criteria for determining the fill's acceptability for disposal in and along Lake Huron. Section 5.04 of the EIS states that "water quality in the area to be dredged would temporarily be affected in an adverse manner." This statement should be clarified as it was our belief that dredging was not a part of the proposed action, only the disposition of fill material.

As 60000 cubic yards/per year (cy/yr) of drift is either being interrupted or diverted to deep water, the project's purpose is to replenish 90000 cy initially and 30000 cy annually of beach nourishment in the zone of influence. Yet the EIS indicates that based on volumetric erosion rates, the percent of erosion attributable to Port Sanilac Harbor is 43 percent. The figures derived from taking 43 percent of the volumetric erosion rates (Section 2.32) for those shorelines not protected in the zone of influence and the figure presented for the total nearshore erosion attributable to the Federal Navigation Project at Port Sanilac are considerably less than either the project's initial and annual fill quantities. As authorization under Section 111 (PL 92-483) provides only for mitigation of erosion in excess

of the natural rate, the Final EIS should clarify this substantial difference and the difference between the figure of 30000 cy/yr of material interrupted and/or diverted by the Federal Navigation project and the figure of 12212 cy/yr representing the total nearshore erosion attributable to the Federal project.

According to the EIS, the initial 90000 cy and subsequent annual 30000 cy of unpolluted beach fill will be obtained from commercial borrow pits and transported by truck; but the borrow sites have not yet been designated. The Final EIS should indicate the location of the pit areas and describe the local environmental impacts of removing fill from them. Wherever the material is obtained, a satisfactory sediment erosion control plan should be conditioned upon the contractor. Transport trucks should be sprayed or covered if dust is generated during haulage. The EIS should indicate the number and permanancy of the proposed hopper conveyor system(s) and whether any permanent facilities will be landscaped to reduce their visual impact. Areas impacted by construction activities should also be seeded and landscaped for protection from erosion. Rather than impacting land resources, consideration should be given to alternate sources of clean feeder beach material such as from deep water areas or offshore shoals. Effective implementation and enforcement of the pollution control and restoration programs described in the EIS during construction and continued operation of the proposed action should substantially minimize the project's adverse environmental impacts.

In accordance with EPA procedures, we have classified our comments on this project as LO-2. Specifically, this means that we have no major objections to the project and that we believe additional information is required to fully assess the environmental impact of the project. The classification and date of our comments will be published in the Federal Register. If you have any questions regarding our comments, please contact Mr. Gary A. Williams at 312-353-5756. We appreciate the opportunity to review this Draft EIS.

Sincerely yours,

Gary A Williams

for Donald A. Wallgren
Chief
Federal Activities Branch

D-8

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Science and Technology
Washington, D.C. 20230

August 27, 1975

Mr. P. McCallister
Chief, Engineering Division
Corps of Engineers - Detroit District
U. S. Department of the Army
P. O. Box 1027
Detroit, Michigan 48231

ATTN.: Environmental Resources Branch

Dear Mr. McCallister:

The draft environmental impact statement "Mitigation of Shore Damage Attributed to the Federal Navigation Structures at Port Sanilac Harbor, Michigan," which accompanied your letter of May 23, 1975, has been received by the Department of Commerce for review and comment.

The statement has been reviewed and the following comments are offered for your consideration.

The information on climate is very general, brief, and contains no specifics. In view of the important relationship between storms and erosion, the statement would be enhanced if quantitative data on storms, with the emphasis on windspeeds and direction, were included. Climatological data are available from the National Climatic Center, Asheville, North Carolina 28821.

Improvement of Lake Huron shoreline south of Port Sanilac will consist of an initial protective beach containing approximately 90,000 cubic yards of unpolluted sand fill and subsequent feedings at a rate of 30,000 cubic yards per year (paragraph 1.12). The statement does not provide justification for the amount of sand needed for initial formation of the beach and for subsequent annual feedings, except that the annual nourishment should be equal to the amount of littoral drift which was interrupted or diverted into deep water by the harbor construction. There are no firm rules to determine the quantity of sand needed for initial beach formation. It should provide compensation for sand lost over longer period of time. For this reason, the initial fill of 90,000 cubic yards appears to be reasonable.

As stated above, the annual nourishment should be equal to the amount of littoral drift interrupted by the harbor structures. Paragraph 2.29 provides data on littoral drift from north to south past Port Sanilac. Interrupted drift was deposited at various locations and the drift rates were determined from the annual accretion rates as follows:

> At the beach and nearshore area north of harbor.... 11,000 cubic yards.
>
> In the harbor....16,000 cubic yards.
>
> In the nearshore area lakeward and adjacent to the north breakwater....3,000 cubic yards.
>
> Total annual deposition along the beach within the breakwater, and immediately lakeward of the north breakwater....8,000 cubic yards.

These figures are quite confusing. The first three items add up to 30,000 cubic yards; however, deposits in the harbor should definitely be excluded from the littoral transport. Sampling by the Environmental Protection Agency indicated that deposits in the harbor consist of 100 percent ooze. The remaining accretion figures do not add up to 30,000 cubic yards. It appears that in this case, the correct estimate of interrupted littoral transport should include accretion at the beach and the north breakwater, estimated erosion from the above by the storms from the east, and deposition at the entrance channel and in deeper parts of the lake.

In addition, the information on volumetric erosion rates does not justify the rates of annual feeding. Paragraph 2.33 states that "total nearshore erosion attributable to the Federal navigation project is about 12,212 cubic yards per year. Total nearshore erosion is 28,400 cubic yards per year." From this, one can conclude that annual beach feeding at the rate of 30,000 cubic yards will be about two and a half time larger than erosion attributable to Federal project and exceed even the total erosion from both the natural causes and the Federal project.

The statement does not discuss in detail alternate sources for the unpolluted sand fill, although it says that land borrow and offshore borrow areas were considered as potential sources of feeder beach material (paragraph 1.25). It is suggested that review be made of an offshore borrow area near Port Sanilac. Location and dimensions of the pit should be such that it would intercept the littoral drift diverted into deep lake and also drift deposited in the entrance channel. This would eliminate the maintenance dredging of the entrance channel and would provide clean, well-sorted sand for beach fill. It seems that specific size gradation to satisfy the requirements of optimum fill material (paragraph 1.25) is superfluous. That requirement is to provide stable beach with minimum erosion and movement of beach material. In this project, however, the fill areas should serve to create a stream of littoral drift in order to reduce erosion of the entire length of shoreline instead of a limited length within the feeder beach.

The statement indicates that the source material obtained from land borrow areas could be transported by truck, then placed over the bluff by hopper-conveyor system where it would then be spread into place by earth moving equipment. As the statement correctly judges, utilization of the aforementioned plan would cause inconvenience to motorists using residential streets, and diesel fumes would irritate residents living along these streets as would the noise from the trucks, earth moving equipment, and hopper-conveyor systems. It is suggested that in connection with sand from offshore borrow area, transport of the sand be accomplished by shallow draft barges. Placement of sand in shallow water near the shore can be either by pumping or by bottom dumping. Distribution of the sand should be left to natural forces of the lake, such as waves, currents, and ice cover. Similar methods of sand transport and placement are employed on some Lake Michigan harbors. No difficulties are apparent for application of the same methods on Lake Huron. From superficial examination of several projects, it appears that transport of sand over water routes instead of land is less costly and would result in significant savings of public funds.

Thank you for giving us an opportunity to provide these comments, which we hope will be of assistance to you. We would appreciate receiving six copies of the final statement.

Sincerely,

Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

JUL 31 1975

PEP ER-75/492

Dear Mr. McCallister:

This is in response to your May 28, 1975, letter forwarding the draft environmental statement for Mitigation of Shore Damage Attributed to the Federal Navigation Structures at Port Sanilac Harbor, Michigan. We have reviewed the document and offer the following views and comments.

General

The overall approach used in the preparation of the environmental sections of the impact statement has resulted in some generalities and ambiguities. Although it appears from the description of the project environment that there will be minimal damage to flora and fauna, assessment of the impact is tenuous because of the paucity of data presented.

Generally, the description of the environmental setting at the project sites (the initial protective beach and subsequent feeder beaches) is not adequate. The inclusion of photographs of the bluffs and the land areas between highway 25 and the bluffs would greatly enhance the statement.

Expanded discussion is also needed regarding the physical dimensions of the hopper-conveyor system and how this system may affect trees, shrubs, and terrestrial wildlife in the project area.

Specific

Project Description

The reader's understanding of the need for the project would have been greatly enhanced by the inclusion of photographs in the environmental impact statement showing shore erosion south of the Port Sanilac breakwaters. We suggest the final statement

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

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include such photographs. Also, we urge that Plate 2 be revised for the final statement to clearly indicate the extent of protective and feeder beaches which will be created under the project. Additionally, it would be helpful if Plate 2 were to show the boundaries of the State roadside park.

The materials to be obtained from unspecified pits and deposited at the beach-nourishment sites have been described only as unpolluted sand or as clean sand (page 7, paragraph 1.32). In addition, the character of material present at the proposed deposition site has not been described, except in highly general terms, although sampling has evidently been extensive. For example, it is stated that surface samples were taken in the bluff, backshore, foreshore, and nearshore area, but information on specific locations, times, and results of this sampling have not been provided (page 17, paragraph 2.21). The only indication of analytical results is that "optimum fill material has a mean diameter of .31 mm" (page 3, paragraph 1.09), without further explanation of how that figure was derived.

Referencing subsection 1.33, the statement should provide evidence of consultation with the State Historic Preservation Officer concerning properties in the project area which may be eligible for inclusion on the National Register of Historic Places.

The final statement should also reflect the results of any archeological survey work and any recommendations for preservation of archeological resources or mitigation of project impact. An important objective of such an investigation should be to locate and assess such resources with regard to their National Register eligibility (refer to 36 CFR 800).

Environmental Setting

Paragraph 2.71, page 35. Reference is made in this section to "previous indigenous fish populations" that were affected by harbor dredging. However, there is no discussion or list provided for those fish species that may currently be utilizing the littoral zone which will be altered by the beach nourishment project. Current fish data applicable to the project site should be provided in the statement.

Paragraph 2.72, page 35. Since the mitigation of shore damage project will not involve Port Sanilac Harbor itself, inclusion of an analysis of the harbor's benthic populations is not really applicable. Presentation of macro-invertebrate data at the proposed beach nourishment sites would be of greater value.

Environmental Impacts

It is stated in paragraph 1.12 on page 4 that, "The exact pit site or sites for (sand fill) supply will not be decided upon until Plans and Specifications Stage." The extraction of 90,000 cubic yards of sand initially and thereafter up to 30,000 cubic yards per year may have a significant environmental impact on existing or potential recreation resources. Thus, we strongly urge that the final statement indicate the possible pit sites and include a discussion of the environmental impacts of the long-term extraction of sand from each site should it be selected to provide the sand fill.

We suggest the final statement indicate the season and length of time during which project activities would be taking place at the State roadside park because during these periods of time public use of the park beach would be curtailed or prohibited.

Since the project is expected to make the beaches more attractive to recreational use, decrease bluff erosion, and improve the project area's aesthetics, it may engender a significant level of vacation and retirement home construction in the project area. We urge that this secondary environmental impact be addressed in the final statement.

Adverse Effects

Paragraph 5.05, page 44. It would be helpful to define what is meant by the term "mass wasting" as it effects the unstable bluffs.

Information presented in the Project Description, page 1, and the Plan of Improvement, page 3, implies that the project will in no way involve the interior area of Port Sanilac Harbor. However, paragraph 5.04, page 44, suggests that the project will involve dredging of harbor sediments. This should be clarified.

Alternatives

It is evident from information provided in the draft environmental statement that significant losses may result from future erosion, whether attributable to the Federal structures or to natural causes. For example, as a result of past erosion in the problem area it has been observed that"presently large trees and other vegetation are falling into the lake, personal properties and homes are being lost, other homes are being threatened" (page 49, paragraph 7.01). It has also been noted that "private individuals have constructed numerous structures with little or no coordination" (page 18, paragraph 2.23). In spite of these circumstances, none of the alternatives that have been considered include governmental efforts to encourage, require or coordinate measures by local owners to protect existing shoreline environment from further damage. Although the Corps itself may lack direct authority or responsibility in the matter, we believe it could highlight the need and suggest ways in which State and/or local government could attack the problem.

The alternative of shoreland regulation and management techniques would evidently be directed solely toward preventing unwise future development (page ii, paragraph 3; page 45, last paragraph). Since factors contributing to bluff erosion include groundwater seepage and sheet erosion (page 2, paragraph 1.06), it is suggested that the mitigation plan include advising and encouraging local owners, through state and/or local government as appropriate, to apply measures to their own land designed to control such erosion, and to contribute generally to control of natural erosion along the bluffs adjoining the proposed beach-nourishment project.

We hope these comments will assist you in preparation of the final statement.

Sincerely yours,

Stanley K. Hathaway

Deputy Assistant Secretary of the Interior

Mr. P. McCallister
Chief, Engineering Division
U.S. Army Engineer District, Detroit
ATTN: Environmental Resources Branch
P.O. Box 1027
Detroit, Michigan 48231

MICHIGAN DEPARTMENT OF STATE
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MICHIGAN HISTORY DIVISION
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June 6, 1975

U.S. Army Corps of Engineers, Detroit District
Attn: Chief, Environmental Resources Branch
P.O. Box 1027
Detroit, Michigan 48231

Gentlemen:

Staff members of the Michigan History Division have reviewed the following Draft Environmental Statement:

Mitigation of Shore Damage Attributed to the Federal Navigation Structures at Port Sanilac Harbor, Michigan.

We conclude that the project will have no impact upon cultural resources in the vicinity.

Sincerely yours,

Martha M. Bigelow (MMB)

Martha M. Bigelow
Director, Michigan History Division
and
State Historic Preservation Officer

MMB/pr

STATE OF MICHIGAN

WILLIAM G. MILLIKEN, Governor
DEPARTMENT OF NATURAL RESOURCES
STEVENS T. MASON BUILDING, LANSING, MICHIGAN 48926
HOWARD A. TANNER, Director

July 3, 1975

Mr. P. McCallister, Chief
Engineering Division
U.S. Army Engineer District, Detroit
Attn: Environmental Resources Branch
P.O. Box 1027
Detroit, Michigan 48231

Dear Mr. McCallister:

We have reviewed the draft environmental impact statement on the proposed mitigation of shore damage attributed to the federal navigation structures at Port Sanilac Harbor, Michigan.

The statement adequately describes the project and the environmental impacts related to it. However, we would point out a few areas where more information would be helpful. It would be very helpful if a map were provided showing the amount and area of artificial accretion and amount and area of accelerated erosion. Additional comments will address page and paragraph in the text.

Page 1, paragraph 1.04
In regard to the "limits of the Section III authority", a discussion should be added as to whether more permanent measures could be entered into if private citizens have any additional costs above the cost of mitigating effects of the navigation structures.

For example, the alternatives might logically include the purchase of the fronting properties or at least the purchase of the rights to damage the property because of the erosion. Evacuation should be a viable alternative because of the high risk erosion area setbacks under Michigan's Shorelands Management and Protection Act is indeed based upon a 30-year erosion rate (which is the amortization of the cost of building). Furthermore, it seems that a stable profile should eventually be reached for the formation of a beach from accumulated sediments, probably

cobble or gravel. This alternative might include giving the owners the opportunity to sell or reach an agreement by reimbursement of damages caused by Corp activities. Presumably, at some point, the up current accretion behind the structure should be completed, and sand would then carry across the mouth to reaccumulate on the down side of structure, thereby re-establishing the beach.

The alternative might also logically include pumping sand from the accretion site north of the Harbor to the enrichment area south of the Harbor (thereby restoring natural process). This would be a two edged sword--it would restore the beach and would avoid a future need to dredge the sand bar which will eventually form over the harbor mouth, if the accretion continues until it reaches the mouth. It would also establish the legal right of the Corps to manipulate accretion in accordance with historic "before structure" processes.

Page 4, paragraph 1.14
It is stated that "when the lake level is above 579.8 feet, lands above that point are also in the public trust." More correctly the reference should be to "submerged lands" above that point.

Page 6, paragraph 1.28
Procedures and guidelines should be comprehensively outlined for the contractors engaged to perform this work. This should be discussed in the statement.

Page 34, paragraph 2.68
With reference to the data on Lake Huron fish population, commercial fishing data is available to date; sport fishing data is available up to 1974; and data is available on fish populations in the lake. These data can be obtained from the DNR Fisheries Division and U.S. Fish and Wildlife Service.

Page 40, paragraph 3.15
This subsection refers to "ocean waters" and we fail to see its applicability to this project.

Page 41, Section 4
We believe the section on environmental impacts of this action should include the impact that will result from the consumption of land based

sand, and the inland areas disrupted by the mining activity. The sand which is proposed to be mined is a non-renewable resource which will be lost to the upland once place in the water. This impact should also be repeated in Section 5 under unavoidable adverse effects.

Page 15, paragraph 2

It is stated that an almost continous seawall and numerous groins now protect the shoreline for a distance of 4,400 feet south of the harbor. Even though erosion in this area is considered minimal, it would seem in part due to the effects of the navigation structures. Was some measure of nourishment considered for the beach in this area?

We trust these comments will be useful in preparation of a final statement, as well as in the preparation of future draft statements on these projects.

Sincerely,

Howard A. Tanner

Howard A. Tanner
Director

ECONOMIC DATA, EXTRACTED FROM U. S. ARMY CORPS OF ENGINEERS SECTION 111 DETAILED PROJECT REPORT ON SHORE DAMAGE AT PORT SANILAC HARBOR, MICHIGAN.

ECONOMIC CONSIDERATIONS

ESTIMATE OF FIRST COST AND MAINTENANCE COST

The estimated first cost of the recommended plan of improvement is $412,600. The estimate includes the direct costs for plant, labor, and materials, and the indirect costs for engineering and design, and for supervision and administration. The estimated annual maintenance cost of providing 30,000 cubic yards of sand for periodic beach nourishment is $105,000.

REAL ESTATE REQUIREMENTS

The costs of any lands, easements, or rights-of-ways required for construction or subsequent maintenance will be borne entirely by the United States. All construction activities and filling at elevations about the ordinary high waterline (579.8 feet) will require permanent and temporary easements from the affected owners. Due to the direct benefits resulting from the project, it is considered that the cost for land payments for the fill areas will be minimal. It is expected that most owners will donate the easements. The easements for access and pipeline will probably require reasonable payment.

ANNUAL COST

The interest rate for the project is 6-1/8 percent and the project life is 50 years. The investment costs represent the total first costs for the project less the estimated nourishment costs during the initial year of the project.

BENEFITS TO SHORE PROPERTY

The mitigation measures recommended in the Section 111 Detailed Project Report on Shore Damage at Port Sanilac Harbor, Michigan, would eliminate the tangible and intangible losses caused by the interruption of the littoral drift by the Port Sanilac Harbor piers.

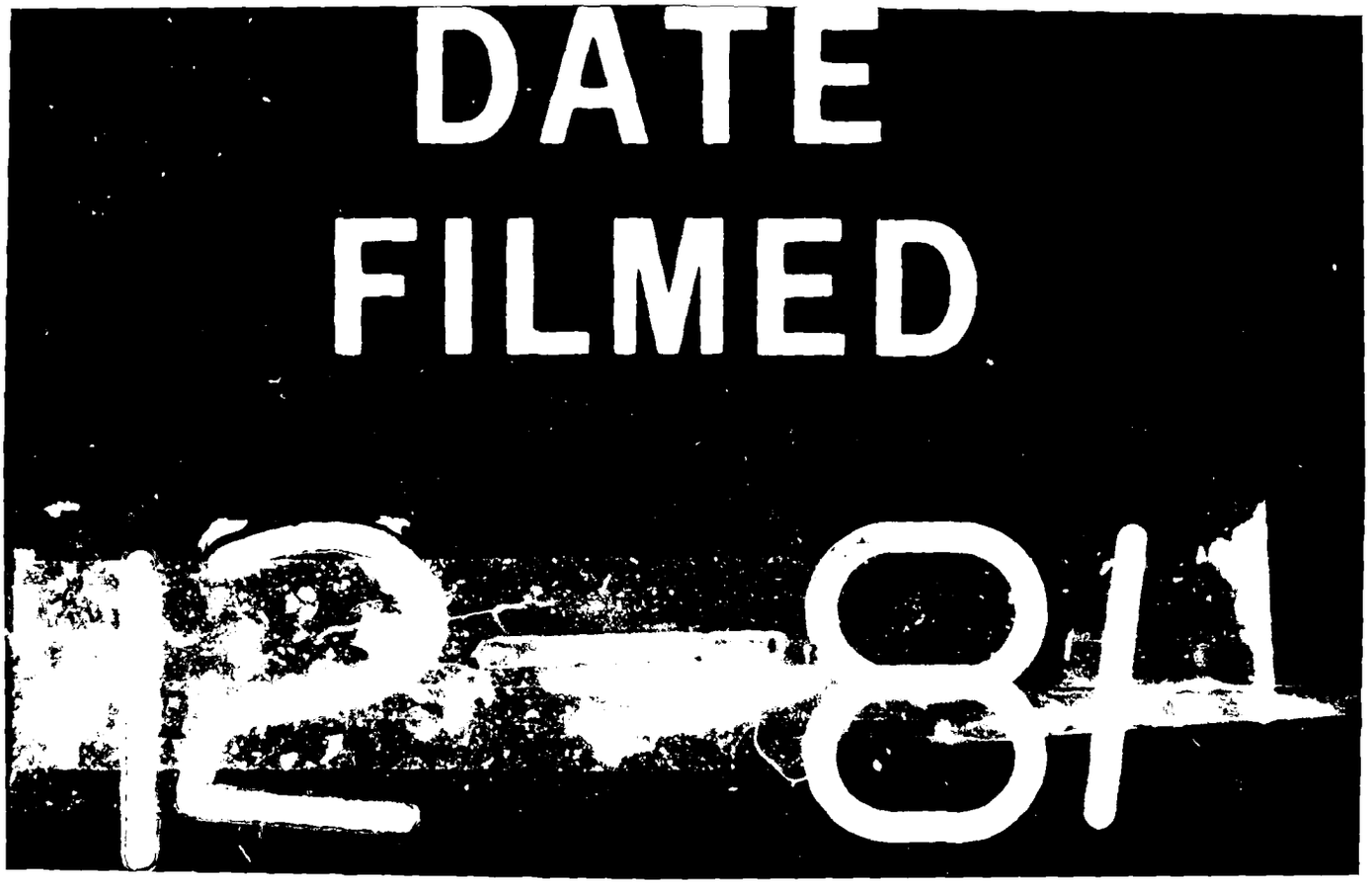
There are some very important intangible and environmental benefits which would result from implementing the recommendations of the Section 111 Detailed Project Report on Shore Damage at Port Sanilac Harbor, Michigan. The most significant intangible benefits to accrue from the mitigation plan are the reduction of the hazard of possible human injury and reduction of insecurity and mental anguish among residents regarding property and

other losses. Restoring the littoral drift would provide the sand needed to begin natural development of protective beaches along the shore damage area. This would mitigate damage attributable to the Federal harbor structures, improve the stability of the littoral environment, improve the turbid condition of the lake, and improve fish and wildlife habitat. The resulting beaches would be aesthetically pleasing as well as providing recreational bathing and surf fishing beaches.

Recreational benefits have been included in the estimate of tangible benefits for the Section 111 Detailed Project Report on Shore Damage at Port Sanilac Harbor, Michigan. The 1,000 feet of beachfill area (150,000 square feet) to be placed in front of the State Roadside Park will provide an increased recreational potential for the Port Sanilac area. Before the beach in front of the Roadside Park eroded, people used the beach for swimming, sunbathing, picnicking and sightseeing. Due to the lack of public beach facilities in the area, the beach was generally crowded, especially on weekends and holidays. The Port Sanilac Road Commission estimates that an average of about 600 people per day will use the beach between May and October (184 days). Based on a visitor day value of $0.80, it is estimated that the annual benefit associated with the restoration of this beach area would be $88,320.

BENEFIT-COST RATIO

The considered plan to mitigate shore damages attributable to the Federal navigation works at Port Sanilac Harbor is engineeringly feasible and economically justified. The selected plan to restore littoral drift has average annual benefits of $172,920, as compared to average annual [illegible] of [illegible]. The resulting benefit to cost ratio is 1.31 to 1.00.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